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No. 6

Name of vessel.	Where and by whom building.	Probable date of completion.	Dimensions			Displacement tons.	Indicated horse power.	Contract speed, knots.	Type of engine.	Type of boilers.	Contract price exclusive of armor and armament.
			L'th L. W. L.	Beam.	Mean draught						
Battleships.											
Illinois.....	Newport News Works, Virginia.....	Dec., 1900.	368	72.2	23.6	11,565	10,000	16	Twin-screw, vertical, triple expansion..	8 Sing. end. cylind....	\$2,595,000
Wisconsin.....	Union Iron Works, San Francisco.....	Dec., 1900.	368	72.2	23.6	11,565	10,000	16	Twin-screw, vertical, triple expansion..	8 Sing. end. cylind....	2,674,950
Maine.....	Cramp & Sons, Philadelphia.....	June, 1901.	388	72.2	23.6	12,300	16,000	18	Twin-screw, vertical, triple expansion..	24 Niclausse.....	2,885,000
Missouri.....	Newport News Works, Virginia.....	Feb., 1902.	388	72.2	23.6	12,230	16,000	18	Twin-screw, vertical, triple expansion..	12 Thornycroft.....	2,885,000
Ohio.....	Union Iron Works, San Francisco.....	Mar., 1902.	388	72.2	23.6	12,440	16,000	18	Twin-screw, vertical, triple expansion..	12 Thornycroft.....	2,899,000
Shea'd battleship.	Moran Bros. Co., Seattle.....	June, 1904.	43	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion..	24 Babcock & Wilcox.	3,723.6 0
Shea'd battleship.	Newport News Works, Virginia.....	June, 1904.	435	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion..	24 Babcock & Wilcox.	3,590,000
Shea'd battleship.	Bath Iron Works, Bath, Me.....	June, 1904.	435	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion..	24 Babcock & Wilcox.	3,590,000
Unsh'd battleship.	Fore River Engine Co., Quincy, Mass.....	June, 1904.	435	76.2	24	14,600	19,000	19	Twin-screw, vertical, triple expansion..	24 Babcock & Wilcox.	3,405,000
Unsh'd battleship.	Fore River Engine Co., Quincy, Mass.....	June, 1904.	435	76.2	24	14,600	19,600	19	Twin-screw, vertical, triple expansion..	24 Babcock & Wilcox.	3,405,000
Armored Cruisers.											
Armored cruiser..	Cramp & Sons, Philadelphia.....	June, 1904.	502	70.	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,890,000
Armored cruiser..	Cramp & Sons, Philadelphia.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,730,000
Armored cruiser..	Union Iron Works, San Francisco.....	June, 1904.	502	70.	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,800,000
Armored cruiser..	Union Iron Works, San Francisco.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,750,000
Armored cruiser..	Newport News Works, Virginia.....	June, 1904.	502	70.	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,885,000
Armored cruiser..	Newport News Works, Virginia.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion..	30 water tube.....	3,775,000
Protected Cruisers.											
Protected cruiser.	Neafie & Levy, Philadelphia.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion..	16 water tube.....	2,740,000
Protected cruiser.	Bath Iron Works, Bath, Me.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion..	16 water tube.....	2,750,000
Protected cruiser.	Newport News Works, Virginia.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion..	16 water tube.....	2,741,000
Monitors.											
Arkansas.....	Newport News Works, Virginia.....	Sept., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion..	4 Thornycroft.....	960,000
Connecticut.....	Bath Iron Works, Bath, Me.....	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion..	4 Niclausse.....	962,000
Florida.....	Lewis Nixon, Elizabeth, N. J.....	Apr., 1901.	252	50	12.6	3,335	2,400	11.5	Twin-screw, vertical, triple expansion..	4 Mosher.....	925,000
Wyoming.....	Union Iron Works, San Francisco.....	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion..	4 Babcock & Wilcox..	975,000
2d Class Cruisers.											
Denver.....	Neafie & Levy, Philadelphia.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion..	6 water tube.....	1,080,000
Galveston.....	Wm. R. Trigg Co., Richmond.....	Jan., 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion..	6 water tube.....	1,027,000
Chattanooga.....	Lewis Nixon, Elizabeth, N. J.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion..	6 water tube.....	1,039,966
Cleveland.....	Bath Iron Works, Bath, Me.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion..	6 water tube.....	1,041,650
Tacoma.....	Union Iron Works, San Francisco.....	Apr., 1902.	292	44	15.9</						

New Lake Ships valued at \$12,535,000.

The value of sixty-one vessels of all kinds (all but six of them steel) building or under order on the great lakes at this time is \$12,535,000. The list includes forty-eight freighters of a combined capacity of 187,050 gross tons on 18 ft. draught. This means that excluding vessels building for salt water service the new lake fleet will have a capacity for a full season of more than 3,000,000 gross tons, but of course not all of these vessels are to be out for the full season of 1901. In this list of sixty-one vessels only five are tow barges. The fact that only six small vessels in the list are of wood proves the well-founded claim of the past few years that the wooden ship will soon be a thing of the past. Ten of the vessels, all steel freighters, are for Atlantic trade. Eight of these salt water ships are of the regulation Canadian canal dimensions, about 3,000 tons capacity, and two, that are to be taken to the seaboard in sections, will carry 7,000 tons each, with 1,000 tons bunker capacity, on the deep ocean draught.

Of course the several large yards of the American Ship Building Co. (consolidation) are to turn out the great bulk of this production. They have building or under order thirty-four steamers and two tow barges, all of steel and valued at \$9,335,000. Of the thirty-four steamers all but two are freighters and their combined capacity on 18 ft. draught is 154,700 gross tons. The two exceptions are the large side-wheel passenger steamers that are to be operated between Detroit and Buffalo and which are each to exceed \$600,000 in cost.

A list of thirty-six vessels, all steel, under construction at different yards of the American Ship Building Co. on the Great Lakes, February, 1901.

Building at	Name of vessel.	Type.	Dimensions in feet.				Dimensions of engines.	Kind of boilers.	Steam pressure lbs.	Capacity, gross tons, 18 feet draught.	Approximate cost.	Building for
			Overall	Keel	Beam	Depth.						
Lorain, O.	Neptune.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	\$215,000	J. C. Gilchrist, Cleveland.
Lorain, O.	Saturn.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	J. C. Gilchrist, Cleveland.
Lorain, O.	Venus.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	J. C. Gilchrist, Cleveland.
Lorain, O.	Jupiter.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	J. C. Gilchrist, Cleveland.
Cleveland, O.	J. T. Hutchinson.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	Hutchinson & Co., Cleveland.
Detroit, Mich.	D. M. Whitney.	Cargo stmr.	424	404	51	28	22, 35, 58x42	Scotch	165	5500	285,000	Whitney Trans. Co., Detroit.
Detroit, Mich.	Mars.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	J. C. Gilchrist, Cleveland.
Detroit, Mich.	Uranus.	Cargo stmr.	366	346	48	28	22, 35, 58x42	Scotch	170	4800	215,000	J. C. Gilchrist, Cleveland.
Cleveland, O.	J. J. Albright.	Cargo stmr.	436	416	50	28	23, 37½, 63x42	Scotch	180	6000	285,000	John Mitchell, Cleveland.
Cleveland, O.	Walter Scranton.	Cargo stmr.	436	416	50	28	23, 37½, 63x42	Scotch	180	6000	285,000	John Mitchell, Cleveland.
W. Superior, Wis.	G. A. Flagg.	Cargo stmr.	336	318	42	26½	20, 33, 54x40	Scotch	170	4000	180,000	D. R. Hanna, Cleveland.
W. Superior, Wis.	R. T. Warner.	Cargo stmr.	336	318	42	26½	20, 33, 54x40	Scotch	170	4000	180,000	D. R. Hanna, Cleveland.
W. Bay City, Mich.	S. D. Warriner.	Cargo schr.	312	300	42	24	Steel barge.	Small boiler	120	4000	120,000	D. R. Hanna, Cleveland.
W. Bay City, Mich.	A. W. Thompson.	Cargo schr.	312	300	42	24	Steel barge.	Small boiler	120	4000	120,000	D. R. Hanna, Cleveland.
Chicago, Ill.	North Western.	*Cargo stmr.	256	242	42	26½	20, 33, 54x40	Scotch	175	2850	185,000	Chas. Counselman, Chicago.
Chicago, Ill.	Northman.	*Cargo stmr.	256	242	42	26½	20, 33, 54x40	Scotch	175	2850	185,000	Chas. Counselman, Chicago.
Chicago, Ill.	North Eastern.	*Cargo stmr.	256	242	42	26½	20, 33, 54x40	Scotch	175	2850	185,000	Chas. Counselman, Chicago.
Chicago, Ill.	North Town.	*Cargo stmr.	256	242	42	26½	20, 33, 54x40	Scotch	175	2850	185,000	Chas. Counselman, Chicago.
Chicago, Ill.	W. L. Brown.	*Cargo stmr.	450	430	50	28½	23, 38, 64x40	Scotch	180	6400	280,000	C. W. Elphicke, Chicago.
Chicago, Ill.	Mary C. Elphicke.	Cargo stmr.	450	430	50	28½	23, 38, 64x40	Scotch	180	6400	280,000	C. W. Elphicke, Chicago.
Cleveland, O.	Not named.	Car ferry.	350	338	56	19½	19, 31, 52x36 (Twin).	Scotch	175	5000	345,000	Pere Marquette Ry. Co., Saginaw.
W. Bay City, Mich.	Not named.	Cargo stmr.	376	356	50	28	22, 35, 58x42	Scotch	170	5000	220,000	J. C. Gilchrist, Cleveland.
W. Bay City, Mich.	Not named.	Cargo stmr.	376	356	50	28	22, 35, 58x42	Scotch	170	5000	220,000	J. C. Gilchrist, Cleveland.
Detroit, Mich.	Not named.	*Cargo stmr.	260	248	40	26½	17, 27, 46x36	Scotch	165	3000	180,000	H. T. Morley, Detroit.
Lorain, O.	Not named.	Cargo stmr.	450	430	50	28½	15, 23½, 36½, 56x40.	B. & W. water tube	250	6400	275,000	F. H. Peavey, Duluth, Minn.
Chicago, Ill.	Not named.	Cargo stmr.	450	430	50	28½	15, 23½, 36½, 56x40.	B. & W. water tube	250	6400	275,000	F. H. Peavey, Duluth, Minn.
Chicago, Ill.	Not named.	Cargo stmr.	450	430	50	28½	15, 23½, 36½, 56x40.	B. & W. water tube	250	6400	275,000	F. H. Peavey, Duluth, Minn.
Chicago, Ill.	Not named.	Cargo stmr.	450	430	50	28½	15, 23½, 36½, 56x40.	B. & W. water tube	250	6400	275,000	F. H. Peavey, Duluth, Minn.
Cleveland, O.	Not named.	*Cargo stmr.	443½	430	44	34½	27, 42½, 73x48.	Scotch	170	7000	400,000	C. E. & W. F. Peck, New York.
Cleveland, O.	Not named.	*Cargo stmr.	443½	430	44	34½	27, 42½, 73x48.	Scotch	170	7000	400,000	C. E. & W. F. Peck, New York.
Detroit, Mich.	Not named.	Paddle pass.					Inclined triple.	Scotch			625,000	A. McVittie, et al., Detroit.
Detroit, Mich.	Not named.	Paddle pass.					Inclined triple.	Scotch			625,000	A. McVittie, et al., Detroit.
Buffalo, N. Y.	Wilkesbarre.	Cargo stmr.	404	381	50	28	20½, 30, 43½, 63x42.	Scotch	210	5300	265,000	Lehigh-Valley Trans. Co., Buffalo.
Buffalo, N. Y.	Mauch Chunk.	Cargo stmr.	404	381	50	28	20½, 29¼, 43½, 63x42.	Scotch	210	5300	265,000	Lehigh-Valley Trans. Co., Buffalo.
Detroit, Mich.	Not named.	Cargo stmr.	376	356	50	28	Triple 18-in. high press.	Scotch	170	5100	215,000	Frank E. Kirby, et al., Detroit.
Detroit, Mich.	Not named.	Cargo stmr.	376	356	50	28	Triple 18-in. high press.	Scotch	170	5100	215,000	Frank E. Kirby, et al., Detroit.
Totals.										154,700	\$9335000	

A list of twenty-five vessels (all but six are steel) building in ship yards of the Great Lakes other than those of the American Ship Building Co.

Names of builder.	Type.	Dimensions in feet.			Estimated capacity, gross tons, 18 feet.	Approximate cost.	Dimensions of engines.	Kind of boilers.	Building for
		Overall	Beam	Depth.					
Craig S. B. Co., Toledo, O.	*Frt. and Pass. stmr.	260	33	25	2800	\$195,000	21, 35, 58x40.	Three Scotch	United Fruit Co., New York.
Craig S. B. Co., Toledo, O.	*Frt. and Pass. stmr.	260	33	25	2800	195,000	21, 35, 58x40.	Three Scotch	United Fruit Co., New York.
Craig S. B. Co., Toledo, O.	*Freight stmr.	260	43	26½	3000	175,000	20, 32½, 55x40.	Two Scotch	Messrs. Hawgood, Cleveland.
Craig S. B. Co., Toledo, O.	Frt. and Pass. stmr.	240	40	16		140,000	21, 35, 58x40.	Four Roberts	Holland & Chicago Trans. Co., Chicago.
Craig S. B. Co., Toledo, O.	Frt. and Pass. stmr.	216	34	12		165,000	21, 35, 58x30.	Four Roberts	Arnold Trans. Co., Mackinaw, Mich.
Craig S. B. Co., Toledo, O.	Excur. stmr.	185	3	12½		100,000	15, 25, 42x24.	Two Roberts	Booth Packing Co., Chicago.
Craig S. B. Co., Toledo, O.	Excur. stmr.	130	12	8		60,000	20 and 42x24.	Two Roberts	Sandusky & Isld. Trans. Co., Sandusky.
Jenks S. B. Co., Pt. Huron, Mich.	Cargo stmr.	256			3000	175,000	Triple expansion.	Two Scotch	Cheesbrough Bros., Detroit.
Jenks S. B. Co., Pt. Huron, Mich.	Cargo stmr.	256			3000	175,000	Triple expansion.	Two Scotch	Builders' account.
Bertram Eng. Works, Toronto.	Paddle pass. stmr.	212			1800	80,000	Fore-and-aft comp.	One fire box	Samuel Neff & Son, Milwaukee.
Bertram Eng. Works, Toronto.	Paddle pass. stmr.	290				325,000	Inclined trip. exp.	Four Scotch	Richelieu & Ont. Nav. Co., Montreal.
Bertram Eng. Works, Toronto.	Cargo stmr.	340				460,000	Inclined trip. exp.	Six Scotch	Richelieu & Ont. Nav. Co., Montreal.
Hamilton Bridge Co., Hamilton, Ont.	Cargo barge.	206	40	14½	2450	45,000	Vertical trip. exp.	One Scotch	For a syndicate of owners.
Corrier, Laine & Co., Levis, Ont.	Cargo barge.	206	40	14½	2450	45,000			Montreal Trans. Co., Montreal.
Collingwood S. B. Co., Collingwood, Ont.	Frt. and Pass. stmr.	325			3300	300,000	26, 42, 70x42.	Four Scotch	Montreal Trans. Co., Montreal.
Bell Engine Works, Buffalo.	Tug.	75	17			20,000	12½ and 32x24.	Two Roberts	Northwest Trans. Co., Sarnia, Ont.
Polson Iron Works, Toronto.	Hyd. dredge.	126				100,000	Stern wheel eng.	Two Heine	Dunbar & Sullivan, Buffalo.
Polson Iron Works, Toronto.	Ferry stmr.	104				40,000	18, 38x24.	One Scotch	Dominion government.
Green Bay Vessel Co., Green Bay, Wis.	*Cargo stmr.	282			2000	90,000	Compound eng.	One Scotch	Sault Ferry Co., Sault Ste. Marie, Ont.
L. P. Hill & Co., Fish Creek, Wis.	*Frt. and Pass. stmr.	145			700	60,000	Compound eng.	One Scotch	Green Bay Vessel Co., Green Bay, Wis.
G. S. Ryan, Oshkosh, Wis.	*Frt. and Pass. stmr.	121			250	10,000	High press. eng.	One Scotch	L. P. Hill & Co., Fish Creek, Wis.
Calvin Co., Garden Island, Ont.	*Cargo barge.	200			2000	35,000			Clarke & La Fever, Oshkosh, Wis.
Calvin Co., Garden Island, Ont.	*Tug.	90				8,000	10 and 20½x15.		Builders' account.
Joseph Puller, Sault Ste. Marie, Mich.	*Tug.	92				6,000	High press. eng.		Builders' account.
Totals.					32,350	\$3,204,000			Booth Packing Co., Chicago.

*Building for salt water service.

†Only six vessels thus marked are of wood; all others steel.

The Davis Dry Dock Co. of Kingston, Ont., is building for Capt. J. Roys of Cornwall, Ont., a wooden passenger vessel of 112 ft. length that is to be fitted with triple expansion engines and to cost \$10,000. This company is also building a wooden tug of 62 ft. length to cost \$5,500 and two wooden steam yachts of 45 and 40 ft. length respectively, and to cost respectively \$3,400 and \$2,500; also two or three other small boats and several engines under way for a 50-ft. boat building at Rock Park, Ont., by Frederick Huck, for the A. R. Williams Co. of Toronto and for other parties.

Ossian Bedell of Buffalo has been negotiating for some time past with the American Ship Building Co. for the construction at Buffalo of an excursion steamer of steel—100 by 29 by 9 ft.—to be ready for service on Niagara river upon the opening of the Pan-American exposition, but there has been some misunderstanding regarding the contract and the vessel may not be built at all.

Walter H. Oades of Detroit is building for C. H. Lawrence & Co. of that city a wooden yacht that will cost about \$1,500. The boat will be 66 ft. long and will be propelled by double naphtha engines.

Merchant Ship Building in America.

In the following summary of ship building operations at hundreds of yards on the Atlantic and Pacific coasts and western rivers no effort is made to give totals, either as to value or tonnage. The object is to show the number and kind of vessels building at the different yards and who they are for. The reports in all cases are direct from the builders.

Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia:

Two steel pass. and frt. stmrs., each 341 ft. long, for Ward Line, New York; twin triple exp. eng. and four single-ended Scotch boilers; 4,500 H.P. each.

Two steel pass., frt. and mail stmrs., each 560 ft. long, for International Nav. Co. of Philadelphia; twin triple exp. eng. and nine single-ended Scotch boilers; 10,000 H.P. each.

Two steel pass. and frt. stmrs., each 291½ ft. long, for Clyde Line of Philadelphia; twin triple exp. eng. and two single-ended Scotch boilers; 2,500 H.P.

Cruiser for Turkish government and battleship Retvizan for Russian government, which are not included among naval vessels building by the Cramps for United States government in naval table on preceding page; Turkish cruiser is 330 ft. long and will have twin triple exp. eng. of 12,000 H.P., with seventeen Niclausse water-tube boilers; Russian battleship Retvizan is 384 ft. long, of 12,800 tons displacement and has twin triple exp. eng. with twenty-four Niclausse water-tube boilers.

Newport News Ship Building & Dry Dock Co., Newport News, Va.:

Table of vessels building for United States navy, to be found on a preceding page, shows a very large amount of naval work under way at this plant.

Two steel frt. and pass. stmrs., Korea and Siberia, each 372 ft. over all, for Pacific Mail Steamship Co. of 23 Broad street, New York; twin quadruple exp. eng. with six double-ended and two single-ended Scotch boilers in each ship; 18,000 H.P. each.

Four steel frt. and pass. stmrs. of 406 ft. length each, for Southern Pacific Co. (Morgan Line) of 23 Broad street, New York; triple exp. engines and three double-ended boilers in each; 4,200 H.P. each.

Union Iron Works, San Francisco:

Two twin-screw frt. stmrs.; each 486½ ft. over all; quadruple exp. engines; three Scotch boilers; for American-Hawaiian Steamship Co. of New York; names Alaskan and Arizonian.

Ferryboat Tamalpais; 235 ft. over all; compound side-wheel engines; for North Pacific Coast Ry. Co.

Pass. and frt. stmr. Spokane, 281 ft. over all; triple exp., single screw; three Babcock & Wilcox boilers, water-tube; for Pacific Coast Steamship Co., San Francisco, Cal.

For extensive naval contracts on which this company is engaged, see table of naval vessels on a preceding page.

New York Ship Building Co., Camden, N. J.:

Steel frt. stmr. M. S. Dollar, 310 ft. long, for M. S. Dollar Steamship Co. of San Francisco, Cal.; triple exp. eng. and two single-ended Scotch boilers; 1,500 H.P.

Twin-screw cargo stmr. Texan, 487 ft. long, for American-Hawaiian Steamship Co. of New York; twin quadruple exp. engines and three single-ended Scotch boilers; 3,600 I.H.P.

Two twin-screw steel cargo steamers, Nevadan and Nebraskan, each 371 ft. over all, for American-Hawaiian Steamship Co. of New York; twin triple exp. engines and two single-ended Scotch boilers in each; each of 2,800 H.P.

This company is also said to have just closed contracts with Atlantic Transport Co. for four twin-screw, steel passenger and cargo stmrs. of 12,000 tons displacement, to cost \$1,250,000 each.

Harlan & Hollingsworth Co., Wilmington, Del.:

Steel steam yacht Alvina, 212 ft. over all, for Chas. Fletcher, Providence, R. I.; twin triple exp. eng. and two Scotch boilers; 1,200 H.P.

Steel frt. and pass. stmr., 385 ft. long, for C. H. Mallory & Co., New York; triple exp. eng. and four Scotch boilers; 5,200 H.P.

Two steel ferryboats, each 207 ft. long, for Central Railroad of New Jersey; four-cylinder, triple exp. eng. and three boilers; 1,000 H.P.

Steel frt. stmr., 321 ft. long, for H. T. Knowlton and H. D. Carver, New York; triple exp. eng. and two Scotch boilers.

Steel ferryboat, 169 ft. long, for Penna. Railroad Co.; beam engine and one locomotive boiler.

Dredge hull of steel, 100 ft. long, for H. T. Dunbar of Buffalo, N. Y.

Bath Iron Works, Bath Me.:

Engaged almost entirely on vessels for United States navy, as will be noted by table on a preceding page of naval vessels under construction.

Sea-going steel tug 165 ft. over all and 1,045 tons displacement, for Staples Coal Co.; triple exp. eng. of 900 H.P. and two Scotch boilers.

Eastern Ship Building Co., New London, Conn.:

Two cargo and pass. stmrs., each 630 ft. over all; \$2,750,000 each; twin-screw, triple exp. engines; each sixteen Niclausse boilers; 10,000 H.P. each; for Great Northern Steamship Co. (J. J. Hill of Great Northern Railway).

Fore River Engine Co., Quincy, Mass.:

United States light-ship for Diamond shoal, 121; single condensing engine; two gunboat boilers.

As will be noted by table of naval vessels, this company is engaged on contracts for battleships, cruisers, etc.

Wm. R. Trigg Co., Richmond, Va.:

Engaged largely on vessels for United States navy as noted in naval table on preceding page.

Revenue cutter of steel, 178 ft. long, for government; \$157,000; 620 tons disp.; triple exp. eng. and two Scotch boilers; 1,200 H.P.

Revenue cutter of steel, 206 ft. long, for government; \$217,000; 850 tons disp.; triple exp. eng. and four Scotch boilers; 2,400 H.P.

Pass. stmr. 200 ft. long for Chesapeake & Ohio Ry.; \$125,000; 675 tons disp.; twin triple exp. eng. and two Thornycroft boilers; 2,500 H.P.

Pusey & Jones Co., Wilmington, Del.:

Steel sea-going barge, 194 ft. long; \$50,000; for Rockland & Rockport Lime Co., Rockport, Me.

Steel steam lighter 100 ft. long; \$30,000; comp. eng., 13 and 26x18 in. with one Scotch boiler; for Philadelphia navy yard.

Steel steam lighter 126 ft. long; \$40,000; triple exp. eng., 9, 14¼ and 23½x14 in.; Almy water-tube boiler; for Chas. J. Canfield, Manistee, Mich.

Steel caisson for dry dock; \$40,000; for Brooklyn navy yard.

Also engines aggregating 36,000 H.P. for vessels building by the Harlan & Hollingsworth Co. of Wilmington, Del., and including a quadruple of 19, 30, 35 and 35x30 in.; beam engine of 44 in. diam. and 10 ft. stroke; three gunboat type boilers, each of 8 ft. 9 in. diam. and 20 ft. length.

Neafie & Levy Ship & Engine Bldg. Co., Philadelphia:

Steel towboat, 95 ft. over all; comp. eng. and one Scotch boiler.

Steel pass. and frt. stmr. 277 ft. long over all; triple exp. engine and two Scotch boilers.

Two steel pass. and frt. stmrs., each 162 ft. long; triple exp. engines and two locomotive boilers in each.

Wood towboat, 90 ft. long, machinery only; comp. eng. and one Scotch boiler.

Steel pilotboat, 112 ft. long; comp. eng. and one Scotch boiler.

Steel towboat, 120 ft. long; triple exp. eng. and one Scotch boiler.

Wood towboat, machinery only, 112 ft. long; comp. eng. and one Scotch boiler.

Wood pass. stmr., machinery only, 150 ft. long; triple exp. engines and two Scotch boilers.

Wood towboat, machinery only, 95 ft. long; comp. eng. and one Scotch boiler.

Steel towboat, 170 ft. long; triple exp. eng. and two Scotch boilers.

Moran Bros. Co., Seattle, Wash.:

Barkentine James Johnson for Pacific Clipper Line, Seattle, Wash.; four-masted, wood hull, 231 ft. over all.

United States light-house tender Heather; steel hull, 178½ ft. over all; \$125,000; comp. eng. 20 and 43 by 30 in.; Scotch boilers, 12½x12 ft.

Also overhauling and furnishing four Scotch boilers to Pacific Coast Steamship Co.'s stmr. City of Pueblo; also new Scotch boiler for United States coast survey stmr. Patterson.

Fulton Engineering & Ship Bldg. Works, San Francisco:

Six-masted wooden schooner, 238 ft. over all, for Capt. Godfrey, San Francisco.

Stmr. Chilkat, wood, 121 ft. over all; compound engine, 13 and 28x20 in.; for Alaska Packers' Association, San Francisco.

Stmr. Santa Monica, wood, 174 ft. over all; comp. eng., 14 and 32x24 in.; J. R. Hanify & Co., San Francisco.

Tug Sea Prince, wood, 80 ft. over all; comp. eng., 12 and 27x20; for Ship Owners' & Merchants' Tug Boat Co., San Francisco.

Steel hull tug, 128 ft. over all; comp. eng., 17 and 41x28 in.; for Ship Owners' & Merchants' Tug Boat Co., San Francisco.

Stmr. G. C. Lindaur, wood; dimensions undecided; comp. eng., 14 and 32x24 in.; for Wilson Bros. & Co., San Francisco.

Wood hull stmr.; dimensions undecided; triple exp. eng., 13½, 23 and 40x30 in.; Babcock & Wilcox water-tube boiler; for Sudden & Christenson, San Francisco.

Wood hull stmr.; dimensions undecided; triple exp. eng., 13½, 23 and 40x30 in.; for E. N. Woods Lumber Co., San Francisco.

Wood hull stmr.; dimensions undecided; comp. eng., 12½ and 27x20 in.; for Beadle Bros., San Francisco.

Risdon Iron & Locomotive Works, San Francisco:

Steel stmr., 138 ft. long, for L. D. Baker of Boston; \$72,000; triple exp. eng., Scotch boiler; 700 H.P.

Twin-screw frt. stmr. Geo. F. Haller, wood, 108 ft. long; \$36,000; two comp. engs. and a Scotch boiler; 200 H.P.; for North Alaska Salmon Co., San Francisco.

Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.:

This company, as noted in table of naval vessels on a preceding page, is engaged on a large amount of naval work—torpedo boats and torpedo boat destroyers. Yachts and pleasure craft a specialty otherwise; mainly naphtha launches of 25 to 60 ft. length; eight or ten of these under way, as well as a very large number of small boats; also builds elegant steam yachts, and has one now of 155 ft. length (\$70,000) under construction for Leonard Lewisohn of New York city.

Petersburg Iron Works Co., Petersburg, Va.:

Two wood barges, each 140 ft. over all, for Virginia Dredging Co., Richmond, Va.

Light-ship No. 74, for United States light-house board; 125 ft. over all; comp. eng.; two Scotch boilers.

Sea-going suction dredge, 200 ft. over all, for United States engineer office at Charleston, S. C.

Burlee Dry Dock Co., Port Richmond, Staten Island, N. Y.:

Steel ferryboat Chicago, 206 ft. over all, for Penna. R. R. Co.'s Jersey City service; single cylinder comp. engines and two Thornycroft water-tube boilers.

Steel ocean-going tug, 153 ft. long and to cost \$95,000; triple exp. eng. and one Scotch boiler.

Geo. Lawley & Sons Corporation, So. Boston, Mass.:

Steel steam yacht, 135 ft. over all; single screw, triple exp. eng. and one Scotch boiler; \$65,000; for Wm. T. Eno, New York city.

Auxiliary schr. yacht, 120 ft. over all; \$40,000; comp. eng. and one water-tube boiler; for Henry Sloan, New York city.

John B. Hardy, Tacoma, Wash.:

Pass. stmr. Defiance, wood, 100 ft. over all; cost \$25,000; triple exp. eng. and Scotch boiler; for Matthew McDowell, Tacoma, Wash. Hull is being built by Crawford & Reid, Tacoma, Wash. Mr. Hardy is building an iron and brass foundry and adding steam forge plant to his shop. The principal part of his work at present is mining machinery.

Maryland Steel Co., Sparrow's Point, Md.:

Steam dredge Mills, steel, 300 ft. over all; cost \$500,000; twin triple exp. engines, two Scotch boilers; for Metropolitan Dredging Co., New York.

Car float barge, 340 ft. over all; cost \$95,000; no engines, one Scotch donkey boiler; for N. Y. P. & N. R. R., Norfolk, Va.

Frt. stmr., steel, 350 ft. over all; \$300,000; single screw, triple exp. eng.; two Scotch boilers; for Boston Towboat Co., Boston, Mass.

Two frt. stmrs., steel, 505 ft. over all, each; \$890,000 each; twin-screw, triple exp. eng.; four Scotch boilers; for Boston Steamship Co., Boston, Mass.

Two frt. stmrs., 507 ft. over all; \$900,000; twin-screw, triple exp. eng.; two double-ended and two single-ended Scotch boilers; for Atlantic Transport Co., Baltimore, Md.

Kelley-Spear Co., Bath, Me.:

Four wooden coal barges, each 352 ft. long; \$56,000 each; for New York company, of which H. A. Dean is agent. Names of barges are Havana, Matanzas, Cardenas and Sagua.

Four-masted wooden schr. Chas. S. Hirsch; 172 ft. long; \$40,000; for Chas. S. Hirsch of New York.

Two wooden coal barges, 165 ft. long; \$20,000; for Staples Coal Co., Taunton, Mass.

Two wooden coal barges, 160 ft. long each; \$15,000 each; for Staples Coal Co., Taunton, Mass.

Four-masted wooden schr., 172 ft. keel; \$40,000; for F. T. Hinckley, Bath, Me.

Iowa Iron Works, Ltd., Dubuque, Iowa:

Building high pressure, horizontal engine, 10 in. diameter and 72 in. stroke and boilers for light-draught, stern-wheel steamer for Mexican Development & Construction Co., Palenque, Mex. Hull now under construction in Mexico.

The New England Co., Bath, Me.:

Four-masted wooden schr. Edith G. Folwell, 210 ft. long; \$62,000; for Capt. George L. Kelsey, Clinton, Conn.

Four-masted wooden schr., single deck, short poop, 175 ft. long; \$38,000; for Weston & Co., Jacksonville, Fla.

Four-masted wooden schr., 175 ft. long; \$39,000; for Capt. F. L. Hodgkin, Lamoine, Me.

The Robert Palmer & Son Co., Noank, Conn.:

Car float, 285 ft., for Baltimore & Ohio Railway, Baltimore, Md.

Three car floats, 240 ft. over all, for New York Central & Hudson River Railway, New York.

Ten barges, 207 ft. long, for Philadelphia & Reading Railway Co., Philadelphia.

Steam yacht Vega, 73 ft. over all, for E. Y. Ferguson, Pittsburg.

Lobster stmr., 55 ft. over all, for F. N. Ashbey, Noank, Conn.

Thomas McCosker & Co., Baltimore, Md.:

Wooden tug, 112 ft. over all; cost \$35,000; engines being built by Neafie & Levy Co., Philadelphia.

Wooden tug, 100 ft. long; cost \$28,000; for P. Dougherty Co., Baltimore, Md.; engines being built by Spedden Ship Building Co., Baltimore, Md.

Wooden tug boat, 100 ft. over all; cost \$30,000; for Philip Weaver & Son, Baltimore, Md.; engines being built by Neafie & Levy Co., Philadelphia.

Matthew Turner, 40 California St., San Francisco, Cal.:

Four-masted schr., wood, 190 ft. over all; \$49,000; for Matthew Turner and others.

Four-masted bktne., wood, 220 ft. over all; \$72,000; for Matthew Turner and others.

Spedden Ship Building Co., Baltimore, Md.:

Steel tug boat, 105 ft. over all; comp. eng., 15, 30 by 22 in.; two Scotch boilers, 11 ft. diam. by 11 ft. long; building for Spedden Ship Building Co., Baltimore, Md.

H. M. Bean, Camden, Me.:

Four-masted schr., 210 ft. over all; \$50,000; for Capt. J. G. Crowley, Camden, Me.

Five-masted schr., 290 ft. over all; \$110,000; for Capt. J. G. Crowley, Camden, Me.

Mr. Bean has added a blacksmith shop, a wharf and an acre to his yard and can now build three vessels at the same time. Vessels are all of wood.

George Frentz, Scranton, Miss.:

Three-masted schr., wood, 132 ft. over all; \$15,000; for L. V. Dantzer Lumber Co., Moss Point, Miss.

Hull for dredge boat, 120 ft. over all; for National Dredging Co., Wilmington, Del.

W. D. Crammond, Hawesville, Ky.:

Steamboat, wood, 125 ft. over all; \$10,000; stern-wheel, lever eng.; for W. D. Crammond, Hawesville, Ky.

H. D. Bendixen Ship Building Co., Eureka, Humboldt County, Cal.:

Four-masted schr., wood, 184 ft. 6 in. long; for Joseph Knowland, 22 California street, San Francisco.

Wood hull stmr., 195 ft. long; for Sudden & Christensen, 22 Market street, San Francisco.

Four-masted barkentine, wood, 200 ft. long; for J. Jensen, 3 California street, San Francisco.

Four-masted barkentine, wood, 185 ft. 6 in. over all; for Hind, Rolph & Co., 302 California street, San Francisco.

James M. Bayles & Son, Port Jefferson, Long Island, N. Y.:

Steam yacht, wood, 130 ft. over all; cost \$50,000; triple exp. eng., Almy boiler; for H. C. Windringham, New York.

Holmes Ship Building Co., West Mystic, Conn.:

Five-masted schr., wood, 250 ft. over all; cost \$100,000; for Sutton fleet, New Haven, Conn.

Ollinger & Bruce Dry Dock Co., Mobile, Ala.:

Stern-wheel stmr. Alice, wood; 75 ft. over all; twin eng.; Scotch boiler; for G. M. Luce, Mobile, Ala.

Simpson Lumber Co., Marshfield, Ore.:

Four-masted schr., wood, 230 ft. over all; \$75,000; for Simpson Lumber Co.

Stmr., wood, 175 ft. over all; \$75,000; triple exp. eng., twin screw; for Simpson Lumber Co.

A. & M. Gamage & Co., South Bristol, Me.:

Wooden sail vessel, 67 ft. over all; for Capt. Charles Hatch, Bedford Pool, Me.; also steamboat, wood, 66 ft. over all, for Damariscotta Steam Boat Co., Damariscotta, Me.

John Twigg & Sons, Stockton & North Point, San Francisco:

Wooden schr., 52 ft.; \$5,000; equipped with Union gas eng.; for G. W. Hume & Co., San Francisco, Cal.

Shallow water tug, 40 ft. over all; \$4,000; comp. eng.; for Alaska Packers' Ass'n, San Francisco.

Wooden tug, 55 ft. over all; \$11,000; comp. eng.; for Alaska Salmon Co., San Francisco.

Wooden launch, 40 ft. over all; \$4,000; for D. Donohue, Los Angeles.

Hall Bros., Port Blakeley, Wash.:

Four-masted bktn. James Taft, 235 ft. over all; \$75,000; for Hall Bros. and others.

Four-master schr., 201 ft. over all; \$54,000; for Hall Bros. and others.

Four-masted schr., wood, 201 ft. over all; \$67,000; for W. H. Talbot and others, San Francisco.

Four-masted schr., wood, 225 ft. over all; \$67,000; for San Francisco parties.

Four-masted schr., 225 ft. over all; \$67,000; for R. Sudden and others, San Francisco.

S. D. Leach, Bangor, Me.:

Two steamboats, one 80 ft. over all and the other 60 ft. over all; comp. engs.; for Capt. H. P. Sawyer, Greenville, Me.

John E. Mar, West Haven, Conn.:

Wooden hull, to be used as floating grain elevator, 154 ft. over all; \$80,000; comp. eng., single screw; one Scotch boiler; for Erie Elevator Co., West Haven, Conn.

Grain barge, 112 ft. over all; \$8,000; for John E. Mar, West Haven, Conn.

Frank McWilliams, West New Brighton, Staten Island, N. Y.:

Barge Mary Quigley, wood, for Mason & Quigley, 17 South street, New York.

Three barges, 105 ft. over all, each; for Frank McWilliams, No. 1 Broadway, New York.

Baltimore Marine Railway, Machine & Boiler Works, Baltimore, Md.:

Fishing stmr., 116 ft. over all; steeple eng. with high pressure 12 by 20 in. and low pressure 22 by 20 in.; single screw; one Scotch boiler; for E. J. Cook Co., Baltimore, Md.

Building engine and boiler for stmr. Beatrice, now being lengthened 24 ft. at E. J. Tull's yard, Pocomoke City, Md.

Springfield Boiler & Mfg. Co., Springfield, Ill.:

Self-propelling hydraulic dredge, 192 ft. over all; \$240,000; side-wheel Mississippi river engine and boilers; for Mississippi River Commission, St. Louis, Mo.

Sea-going hydraulic dredge Benyuard, 275 ft. over all; twin screw eng.; four marine boilers; for Bucyrus Co., Milwaukee, Wis. Contract not yet definitely closed but more than probable.

Good Interest Dry Dock Co., Ltd., No. 528 Gravier St., New Orleans:

Stern-wheel stmr., Dixie, wood, 117 ft. over all; lever engine, 25 in.; flue boiler; for Capt. C. W. Drown, 528 Gravier street, New Orleans.

Portland Ship Building Co., Portland, Me.:

Frt. and pass. stmr., 120 ft. over all; \$30,000; comp. eng., single screw; one Scotch boiler; for Frontier Steamboat Co., Calais, Me.

George N. Hitchings, Hoquiam, Wash.:

Four-masted schr. Mahukona, wood, 200 ft. over all; \$50,000; for Hind, Rolph & Co., San Francisco.

Coasting stmr., 204 ft. over all; \$90,000; triple exp. eng., 13, 22½, 38 by 30 in. stroke; two Scotch boilers, 10½ by 10½ ft.; for E. K. Wood Lumber Co., San Francisco.

Hay & Wright, Inc., Alameda Point, San Francisco, Cal.:

Four-masted schr. Mindora, wood, 195 ft. over all; \$55,000; for Sanders & Kirchmann, 20 California street, San Francisco.

Four-masted schr., wood, 195 ft. over all; for Hind, Rolph & Co., San Francisco.

Stmr. Hanalei, 200 ft. over all; for Inter Island Steam Navigation Co., Honolulu.

Stmr., 120 ft. over all; cost of hull alone \$15,000; for Alaska Packers' Ass'n, San Francisco.

Clamshell dredger, 100 ft. over all; for Golden State & M. I. Works, San Francisco.

Joseph Supple, Foot Belmont street, Portland, Ore.:

Tandem comp. eng. and Robery boiler for wood propeller Inland Flyer; for W. S. Sudley and others, Seattle, Wash.

Triple exp. eng. and Almy boiler for wood propeller Naiad; for Robertson Raft Co., San Francisco.

Sharptown Marine Railway Co., Sharptown, Md.:

Four-masted schr., 200 ft. over all; \$80,000; for Capt. William J. Quillan, Bethel, Del.

Sawyer Bros., Millbridge, Me.:

Three-masted schr., wood, 135 ft. over all; \$25,000; not yet sold.

W. A. Boole & Son, San Francisco:

Four-masted bktne., 225 ft. over all; \$80,000; for Hind, Rolph & Co., San Francisco.

This company is building a marine railway of 3,000 tons, which it expects to have in operation by March 1.

H. D. Burleigh & Bro. Transportation Co., Whitehall, N. Y.:

Two wooden canal boats, 102 ft. over all, for themselves. James Williamson is also building two canal boats, John Ryan one and George Nedds one at the same place for New York parties.

Samuel J. Pregnall, Charleston, S. C.:

Tug boat, 65 ft. over all; cost \$5,000; comp. eng.; for Capt. John Moisen, Charleston, S. C.

Tug boat, 70 ft. over all; \$7,500; fore and aft comp. eng.; for Fishing Co., Charleston, S. C.

William S. Currier, Newburyport, Mass.:

Four-masted schr. Adalaide Barbour, wood, 226 ft. over all; \$37,000; for Capt. William E. Tilton, Manasquan, N. J.

S. Gildersleeve & Sons, Gildersleeve, Conn.:

Coal barge, wood, 135 ft. over all; for John Scully, South Amboy, N. J.

Three coal barges, 125 ft. over all; for Louis Gildersleeve, New York, also three 110 ft. over all for the same person.

F. S. Bowker, Phippsburg, Me.:

Three-masted schr. Sequin, wood, 145 ft. over all; \$20,000; for South Gardiner Lumber Co., South Gardiner, Me.

Theodore A. Crane's Sons, Erie Basin, Brooklyn, N. Y.:

Steam hoisting derrick barge, 83 ft. over all; for the Export Lightering Co., New York.

Water barge, 60 ft. over all; for the W. H. Beard Dredging Co., New York.

Tug boat, 82 ft. over all; for the Cuba Co., New York; engine and boiler to be furnished by Brown & Miller, Jersey City, N. J.

Washburn Bros., Thomaston, Me.:

They are building two schrs.—one four-master 210 ft. over all, to cost \$64,000, and one five-master, 235 ft. over all, to cost \$100,000, for themselves.

Read Bros., Fall River, Mass.:

Stmr. Sagamore, wood, 110 ft. over all; \$15,000; comp. eng., single screw; two upright boilers; for Dyer Transportation Co., Providence, R. I.

W. Irving Adams, East Boothbay, Me.:

Two fishing vessels, each 115 ft. over all; one equipped with auxiliary gasoline engine; for S. McKisson, Boothbay, Harbor, Me.

Sail vessel, 94 ft. over all, for T. A. Cromwell, Boston, Mass.

McCausland & Co., Rondout, N. Y.:

Two barges, wood, each 105 ft. over all; for John H. Cullen, Rondout, N. Y.

Barge, wood, 100 ft. over all; for John McGrenney, Rondout, N. Y.

Hartford & New York Transportation Co.:

Twin-screw propeller, dimensions not given; for E. S. Belden, Hartford, Conn.

Jacob S. Ellis & Son, Tottenville, N. Y.:

Tug boat, 65 ft. over all; \$9,500; single eng.; for Robert White, Brooklyn, N. Y.

Oyster boat, 60 ft. over all; \$6,500; comp. eng.; L. W. Bedell, Prince's Bay, N. Y.

F. M. Codina, 209 N. Conceptor street, Mobile, Ala.:

Tug boat Belle, 72 ft. over all; \$10,000; comp. eng., 12, 22 in. by 12 in. stroke; one Scotch boiler 7 ft. by 11 ft.; for Capt. Thomas Dermir & Co., Mobile, Ala. Engine built by Morris Machine Works, Baldwinville, N. Y. Boiler built by Richardson & Goddard, Mobile, Ala.

Greene Bros., Bridgeport, Conn.:

Oyster stmr. Climax, wood, 45 ft. over all; \$3,500; Globe gas engine; for F. G. Hitchcock, Bridgeport, Conn.

Oyster stmr. Katy-did, 50 ft. over all; gasoline engine; for F. B. Parks & Co., Bridgeport, Conn.

Three pleasure stmr., each 50 ft. over all; equipped with gasoline engines; one each for John Vorbeck, Fred Borgel and E. Weber, all of Canaisie, Long Island.

Oyster stmr., 90 ft. over all; \$18,000; engine not determined; for John Smith & Sons, New Haven, Conn.

Four-masted schr., 235 ft. over all; \$64,000; for Bridgeport parties.

William P. Kirk, Toms River, N. J.:

Sloop yacht, wood, 41 ft. over all; for J. Fred Ackerman, New York.

James E. Wignall & Son, Beach and Vienna sts., Phila., Pa.:

Launch, wood, 54 ft. over all; for United States engineers.

Fourteen cutters, yawls and whaleboats for the Imperial Russian navy.

Vaughan W. Bacon, Barnstable, Mass.:

Building only a few small sailboats.

Harry Cossey, foot of 25th st., Brooklyn, N. Y.:

Six grain barges, 112 ft. over all; for Wilson Bros., Brooklyn, N. Y.

Two barges, 100 ft. over all; for himself.

Building dry dock at Verplank on the Hudson river for Morse Iron Works & Dry Dock Co., Brooklyn.

James Tregarther & Son, foot East 7th st., New York:

Two derrick barges, wood, 85 ft. over all; cost \$8,000; and one ballast scow, wood, 100 ft. over all; cost \$5,500; both for themselves.

The Nilson Yacht Building Co., Ferry bar, Baltimore, Md.:

Auxiliary schr. yacht Cyconia, 56 ft. over all; 10 H.P. gasoline eng.; for C. C. Wilkinson and Z. W. Alderman, Washington, D. C.

Three yawls, one each for F. F. Stanley, Boston, Mass., Walter S. Lewis, Boston, Mass., and Louis Cosovant, New York.

Nine cutters and three gigs for the United States navy.

Robert Jacob, City Island, New York:

Three sloops, 42 ft. 9 in. over all; cost about \$4,000; one each for E. A. Weatherbee, New York; Otto Loehke, Shelter Island, N. Y.; and John Hyslop, New York city.

A. C. Howland & Co., Monument Beach, Mass.:

Cruising yawl, 62 ft. over all; cost \$8,000; for D. H. Warner, Bridgeport, Conn.

Knockabout, 32 ft. over all; cost \$1,000; for George H. Wightman, Brookline, Mass.

Cat boat, 22 ft. over all; cost \$1,200; for C. H. Davis, New York.

The New York Marine Power Co., 103 East 125th st., New York:

Six launches and cabin cruisers, averaging 35 ft. over all; total cost \$20,000.

D. D. Kelly & Son and Ambrose A. Martin, East Boston, Mass.:

Wooden car float, 210 ft. over all; cost \$20,000; for Metropolitan Steamship Co., Boston and New York.

Rice Bros., East Boothbay, Me.:

Cabin launch, 41 ft. over all; cost \$4,000; 16 H.P. gasoline eng.; for Rice Bros., East Boothbay, Me.

Cabin launch, 68 ft. over all; cost \$8,500; two 16 H.P. gasoline eng. made by the Standard Motor Mfg. Co., New York; for George F. Hills, Boston, Mass.

Sloop yacht, 73 ft. over all; cost \$9,000; for W. M. Lovering, Taunton, Mass.

Schr. yacht, 76 ft. over all; cost \$12,000; for W. F. Mayo, Boston, Mass.

Stanley Vansant, Atlantic City, N. J.:

Nine sloop yachts, averaging 45 ft. over all and costing approximately \$15,000; for various parties in Atlantic City.

Yard has been enlarged during the past year and equipped with electric motor to operate hand and circular saws and marine railway.

C. H. Hildebrant, Rondout, N. Y.:

Wooden barge, 108 ft. over all; for J. Longenabine, New York.

Six coal scows, 95 ft. over all; for himself.

Robert H. Langford, Pensacola, Fla.:

Two small lighters for Havana; contract price \$1,600; for Henry Peaggio, Havana, agent.

Truscott Boat Mfg. Co., St. Joseph, Mich.:

Building between seventy and eighty launches of various lengths, for all parts of the country. Force of workmen doubled during the year.

Mystic Shipyard, Frank N. Isham, agent, Mystic, Conn.:

Six launches, averaging 38 ft. over all; gasoline engines; awaiting sale.

Al McCabe, Jacksonville, Fla.:

Naphtha launch Nadia, wood, 30 ft. over all; 10 H.P. naphtha eng. Murray & Tregurtha; Parcher L'Engle, Jacksonville, Fla.

E. G. Heald, Auburn, N. Y.:

Thirty launches, wood, 21 to 36 ft.; gasoline motors; for Fay & Bowen, Auburn, N. Y.

Stmr. yacht, 65 ft. over all; cost \$7,500; triple exp. eng., water-tube boiler; for J. H. Kennedy, Brooklyn, N. Y.

George W. Byles, yacht builder, City Island, New York:

Launch, wood, 37 ft.; cost \$2,000; Globe gas. eng.; for George W. Byles, City Island, New York.

Knockabout, wood, 40 ft. over all; for R. M. Sayre, New York.

Greenport Basin & Construction Co., Greenport, N. Y.:

Sloop yacht, wood, 55 ft. over all; cost \$5,000; for Robert Toland, Philadelphia.

Sloop yacht, 40 ft.; cost \$3,500; for F. M. Smith, California.

Samuel G. Wicks & Co., Patchogue, N. Y.:

Sloop yachts, yawls and cat boats, six in number; average 35 ft. over all; approximate value \$10,000.

David Fenton, Manchester by the Sea, Mass.:

Racing yacht, 42 ft. over all; cost \$2,500; for Frank G. Macomber, Boston, Mass.

Mr. Fenton was just burned out. Will put in new machinery and improve works.

E. H. Brown, Taunton, Mass.:

Launches and cat boats, five in number, average 30 ft. over all; total value, \$4,500.

Just put in new equipment of wood working machinery and bought more land to improve works.

J. & R. Weir, 25 to 33 Nazareth st., Montreal, Can.:

One non-condensing vertical engine for barge for Ottawa Forwarding Co., Ottawa, Can. One straightway navy type boiler and one square furnace return tubular boiler for the Canadian government. One Fitzgibbon patent marine boiler for tug for Manning & McDonald, Coteau, Que.

Mozena Bros., Clarington, Ohio:

No steamboat work on hand at present. Have purchased docks for barge work and intend adding a saw mill and additional docks to be able to do steamboat repair work.

Peter Hagan & Co., 218 Walnut st., Philadelphia:

Stmr. Chauncey Vibbard, 281 ft. over all; cost \$20,000; formerly a passenger steamer and now being converted into an outside barge.

Stmr. Thomas Morgan, 260 ft. over all; cost \$6,000; formerly a passenger steamer and now being converted into an outside barge.

Ferry hull Chicago, 210 ft. over all; cost \$60,000; formerly a ferry boat run into and sunk in New York harbor Nov., 1899, and now being converted into an outside barge. All for Peter Hagan & Co.'s use.

Petersburg Iron Works Co., Petersburg, Va.:

Two wooden barges, 140 ft. long, for the Virginia Dredging Co., Richmond, Va.; sea-going suction dredge, 200 ft. long, for the government engineer at Charleston, S. C., and light-ship No. 74, for the government.

The Jackson & Sharp Co., Wilmington, Del.:

Wooden barges Margaret and Elizabeth, 130 ft. long; for the Munson Steamship line.

Two lighters, 125 ft. over all; for the Munson Steamship line.

Wooden barge, 105 ft. over all; for the Charles Warner Co.

Lighter, 115 ft. over all; for E. H. Cathrall.

Wooden car float, 250 ft. over all; for the Chesapeake & Ohio Railroad Co.

Enoch Moore & Sons, Wilmington, Del.:

Three wooden barges, 80 ft. over all; for the Pennsylvania Railroad Co.

Union Iron Works, San Francisco.



THE Union Iron Works are situated at the Potrero in the suburbs of San Francisco, about three miles from the center of the city. These extensive works, with an area of twenty-eight acres, have over twelve acres under cover, with a water frontage of 1,785 ft. The tracks of the Southern Pacific Railway Co. run into the yards and the deepest draught vessels can come alongside the docks, so that shipments can be made to all parts of the world, either by rail or sea. The equipment of this plant is most complete in every particular, steam, electric, pneumatic and hydraulic power being used throughout the works. A ship is built complete here, and ready for sea, everything from furniture to auxiliary machinery being done at the works. The only thing that is done outside is the upholstery work. This system of manufacturing all the auxiliary engines, fittings and outfit at the works of the builder, insures a ship uniformly excellent in quality throughout. All these auxiliary engines, valves and fittings are designed from actual experience, no time nor money being spared to make them perfect. The works manufacture their own steel and bronze castings.

GENERAL DESCRIPTION OF SHOPS.

The machine shop is a brick and steel building containing 36,000 sq. ft. of floor space, and divided into five bays, two of the bays being used for heavy tools, and three of them for light tools and hand work. In the largest bay are situated the great lathes, boring mill and wall planer. The boring mill takes a casting 30 ft. in diameter, 9 ft. 6 in. high, while the planer has a horizontal stroke of 21 ft. 9 in., and a vertical stroke of 10 ft. 4 in. This shop also contains a long shaft lathe having 120 in. swing, being 50 ft. between centers. Another big lathe in this same bay has 125 in. swing, and 40 ft. between centers. These are the largest tools in the machine shop. For handling the work done on these tools, two overhead electric traveling cranes are fitted in this bay, of 30 tons capacity each. The machine shop contains six overhead electric traveling cranes, ranging from 5 to 30 tons, and numerous hydraulic cranes over the individual machines, so that every part of the shop, and every tool in it can be reached by power cranes.

Back of the machine shop, and parallel to it, is the iron foundry, also a steel and brick building, and containing 18,000 sq. ft. of floor space. In this shop the large iron castings are made, ranging up to 25 and 30 tons. The same system of handling is carried on in this shop, overhead electric traveling cranes and hydraulic post cranes covering the floor space. Between this foundry and the machine shop is the brass foundry, a smaller brick and steel building; floor space, 3,360 sq. ft., with 15-ton overhead electric traveling cranes. The pattern shop is a four-story brick building, the lower story of which is used for making patterns, and three upper stories for storing the same. In the end of this building is the store-room, also four stories, from which are issued the supplies to the men in the works, such as bolts and nuts, oil, etc., and general fittings. The erecting shop is a large brick and steel building, having a floor space of 17,676 sq. ft., fitted with two overhead 30-ton hydro-pneumatic cranes, and two 5-ton electric overhead cranes. Embedded in the floor of this shop are six face plates, so that in the erection of machinery wooden blocks are entirely dispensed with, and an absolutely true and level surface is always at hand on which to erect the engines. Five of these face plates are 30 ft., the other being 45 ft. long.

The boiler shop is situated on the other side of the road which separates the ship yard from the engineering part of the works. This boiler shop contains 28,000 sq. ft. of surface, and is fitted up with hydraulic riveters, flanging machines, electric and pneumatic drills, so that boilers may be drilled in place after being assembled. This shop also contains two 60-ton overhead traveling cranes, and the usual outfit of hydraulic and post cranes for handling small

work. The water tube boilers are built in a special building where nothing else is done, which contains the machines for bending, grinding, and sawing off the Thornycroft boiler tubes, or any other design of tubes that may be required. Facing the boiler shop is the steel foundry, fitted with a Tro-

penas converter, which allows castings of five and six tons weight to be made. The ship yard is fitted up with the usual blacksmith, machine, joiner and plate shops, also a saw mill, and hydraulic bending shop, containing 500-ton and 200-ton hydraulic bending presses, where heavy protective deck plates and light armor can be bent cold. This building in all covers about 66,000 sq. ft.

WAYS AND SLIPS OF GREAT CAPACITY.

Situated in front of the building just described, and running to the water, we have the ways for the construction of ships. There are six of these ways, the longest of which has a length of 480 ft. These ways are all covered by heavy timber scaffolding, which carries overhead traveling cranes, so that plates and frames can be lifted over and put on the ship. The longest slip is fitted with four of these cranes, and the other slips with two each. Next to the long slip is situated the galvanizing shop and boat shop, where small boats, such as cutters, whale boats and steam launches are turned out for the vessels building for naval and merchant service.

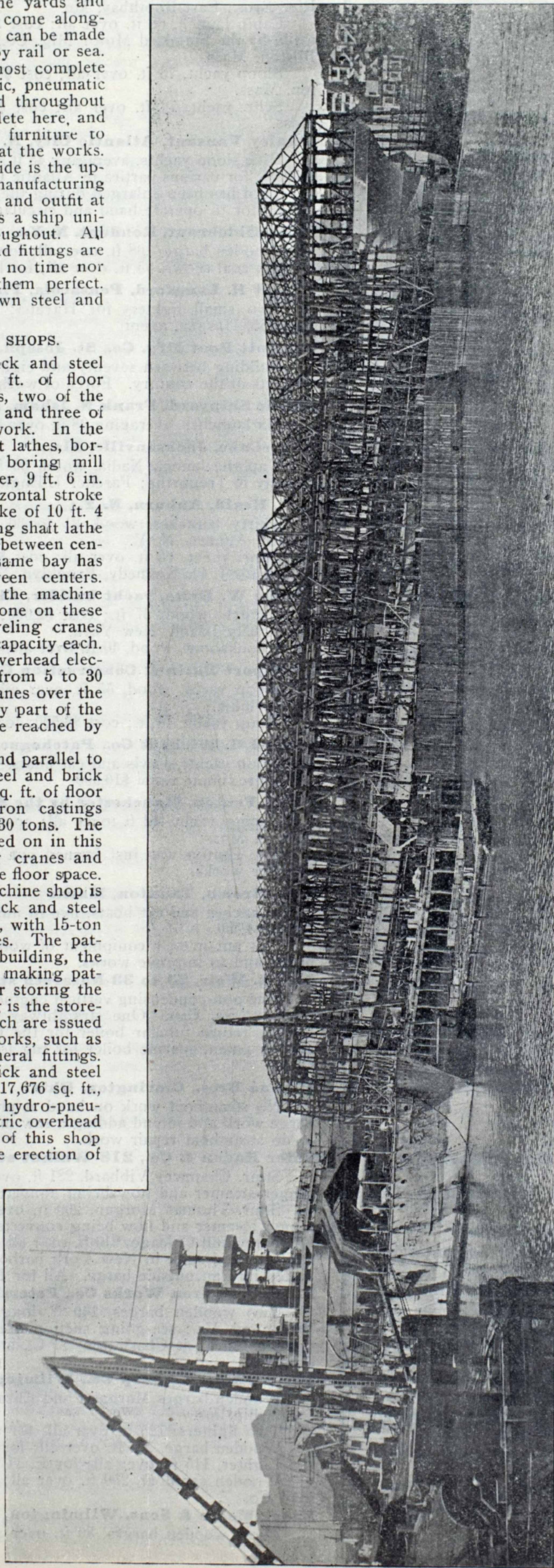
Not the least novel feature of this plant is the hydraulic lift dock, a great steel platform working on the principle of an elevator, and raised by thirty-six hydraulic cylinders, 31 in. in diameter, having a stroke of 15 ft. Vessels of 6,000 tons weight, and drawing 25 ft. of water can be raised to the level of the wharf by this dock. The steel platform itself is 436 ft. long, by 60 ft. wide. The valve mechanism for each cylinder is so arranged that if one cylinder has a tendency to lag behind its valve will open wider, and if it rises too fast the valve will be closed and the cylinder will be brought into line, so that the dock will always be level when coming up, and the strains be uniformly distributed. Parallel to the dock and separated from it by a large wharf, are the fitting out bays where naval and merchant vessels are finished. On this wharf is located the 100-ton shears, used in placing the boilers and engines, armor plate, guns, and all manner of heavy weights on the vessels building.

VESSELS UNDER CONSTRUCTION AT THE UNION WORKS.

It is only necessary to mention such vessels as the world-famed Oregon, and the high speed Japanese cruiser Chitose, to give one an idea of the high class design and conscientious workmanship that is carried out by the Union Iron Works. The Union Iron Works are at present constructing fifteen vessels—eleven vessels for the U. S. government, and four merchant vessels. Among the vessels building for the government may be mentioned the battleship Wisconsin, now about completed; also the battleship Ohio, the armored coast defense monitor Wyoming, the 3,400-ton sheathed protected cruiser Tacoma, the three 29-knot torpedo boat destroyers Paul Jones, Perry and Preble; two submarine torpedo boats, Grampus and Pike, and two 14,000-ton, 22-knot armored cruisers, contracts for which have just been awarded. The following is a short description of the battleship Ohio:

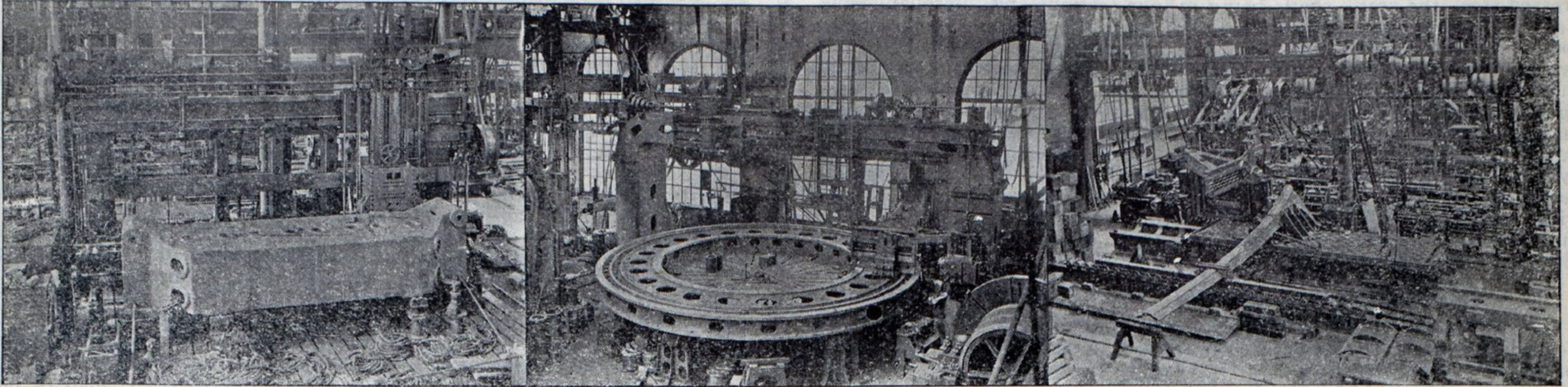
Length on water line.....	388 ft. 0 ins.
Beam molded	72 ft. 0 ins.
Depth molded	34 ft. 6 ins.
Draught, normal	23 ft. 3 ins.
Displacement, about	11,500 tons.
Horse power	16,000 tons.
Contract speed	18 knots.

This vessel is 2,000 tons heavier and 40 ft. longer than the Oregon, and 1,000 tons heavier and 20 ft. longer than the Wisconsin. The contract speed of the Ohio is three knots faster than the Oregon, and two knots faster than the Wisconsin. A speed of about 19 knots is confidently expected from this vessel. In regard to battery, the Ohio carries four 12-in. guns; sixteen 6-in. quick-firers; six 3-in. 14-lb. quick-firers; eight 3-lb. quick-firers and two submerged torpedo tubes. This battery is heavier than the battery carried by



Union Iron Works water front, showing scaffolding over ways to carry overhead traveling cranes, ship under construction and 100-ton shears. Ships under construction going from right to left are: Californian, Preble, Ohio, Wyoming, Perry, Paul Jones and Wisconsin.

In the Machine Shop at the Union Iron Works.



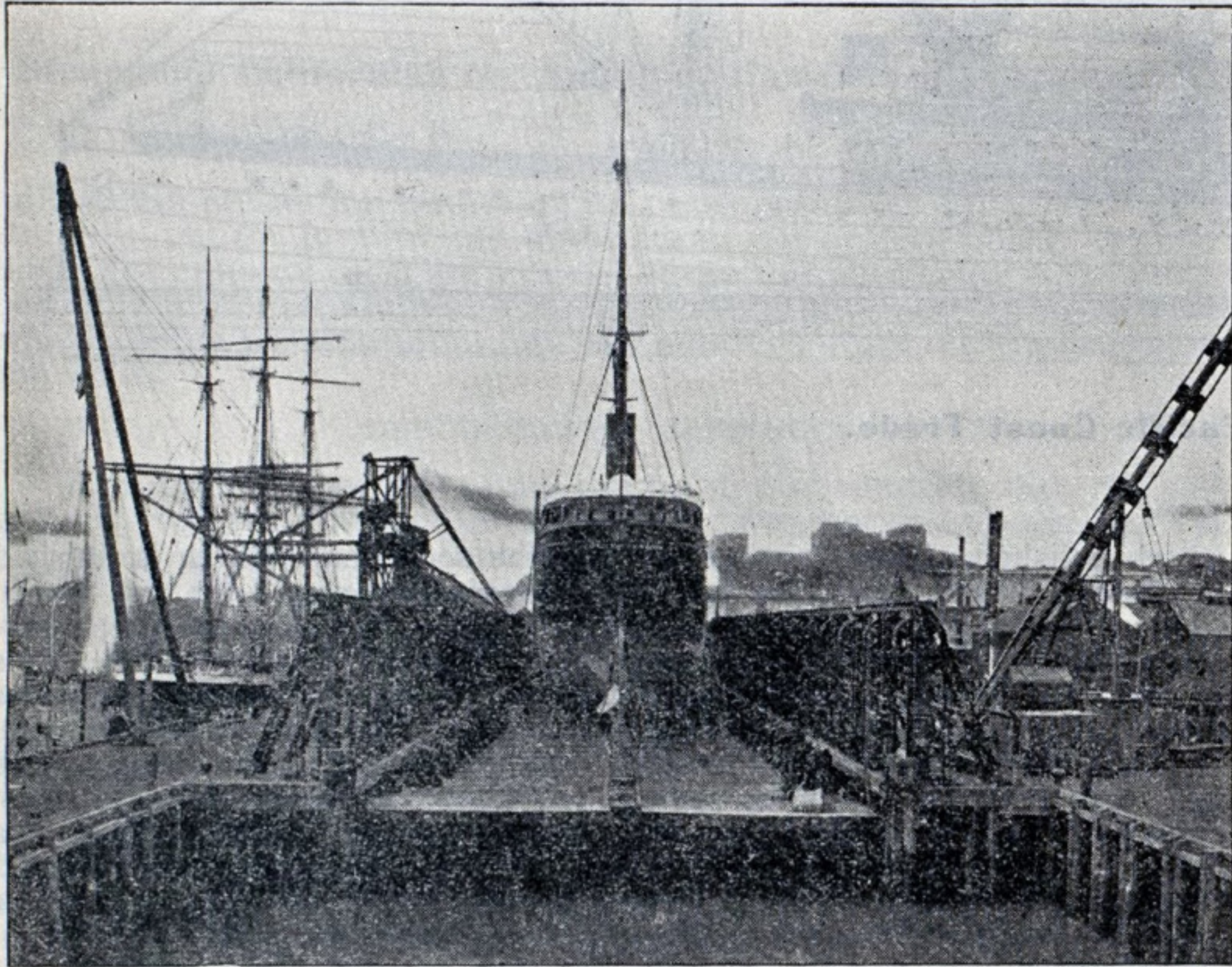
BED PLATE FOR 500-TON BENDING MACHINE, ON WALL PLANER.

26-FT. DIAMETER RING FOR BOILER DRILL PRESS ON 30-FT. VERTICAL BORING MILL.

UPPER PORTION OHIO STERN IN OPEN SIDE PLANER.

the Wisconsin, in that she carries two additional 6-in. guns, and her 14-pdr. battery is not carried on the Wisconsin at all. These guns will be very much more powerful than the guns of the Wisconsin, being the new high-powered navy guns for smokeless powder, and having a muzzle velocity of 3,000 ft.

This vessel is protected by a belt 11 in. thick amidships, between the 12-in. turrets, tapering from that to 4 in. at the bow. Above this main belt is a strake of 6-in. armor; above this another strake of 6-in. armor, protecting the gun deck from being pierced. Above this again is 6 in. of armor protecting the four superstructure 6-in. guns. A diagonal bulkhead



**The Californian in Dry Dock at Union Iron Works,
San Francisco, Cal.**

on the main deck is 9 in. thick, and diagonal casemate bulkheads 6 in. thick. In every respect this vessel will be the best-protected most-powerfully armed, and swiftest of our battleships.

MERCHANT SHIPS UNDER CONSTRUCTION.

Coming to merchant work we find two twin-screw 11,000-ton cargo vessels, the Alaskan and Arizonian, for the American-Hawaiian Steamship Co. for the trade between San Francisco, Honolulu and New York, and the Spokane for the Pacific Coast Co., a vessel designed especially for the Alaskan excursion trade. Also the steel paddle ferry boat Tamalpais, to ply between San Francisco and Sausalito, in San Francisco bay. It will suffice to describe one or two of the merchant vessels building at this yard to give one a good idea of the magnitude and class of work turned out by this company. The Alaskan and Arizonian being alike, a description of one will be a description of both. The Alaskan is a steel twin screw steamer, built to Lloyd's three-deck rule, having a complete shelter deck. Her length between perpendiculars is 471 ft. 1 in.; beam molded, 57 ft. 0 in.; depth, molded, to shelter deck, 42 ft. 6 in. A generous height is allowed between decks, to facilitate the stowage and handling of cargo. The Alaskan is built on the deep-frame principle. This vessel when loaded to a depth of 27 ft. is to carry 11,000 tons, including water in boilers, and will rank 100 A1 at Lloyd's. The rig will consist of two short straight masts used for handling cargo and steadying sails only. Along each side of the vessel will be fitted three short steel posts carrying cargo hoists to work intermediate hatches not reached by the booms on the two main masts. In connection with the cargo handling gear fifteen vertical steam winches will be installed, special care having been taken with the leads to booms and such matters, so that the most expeditious handling of cargo may be insured.

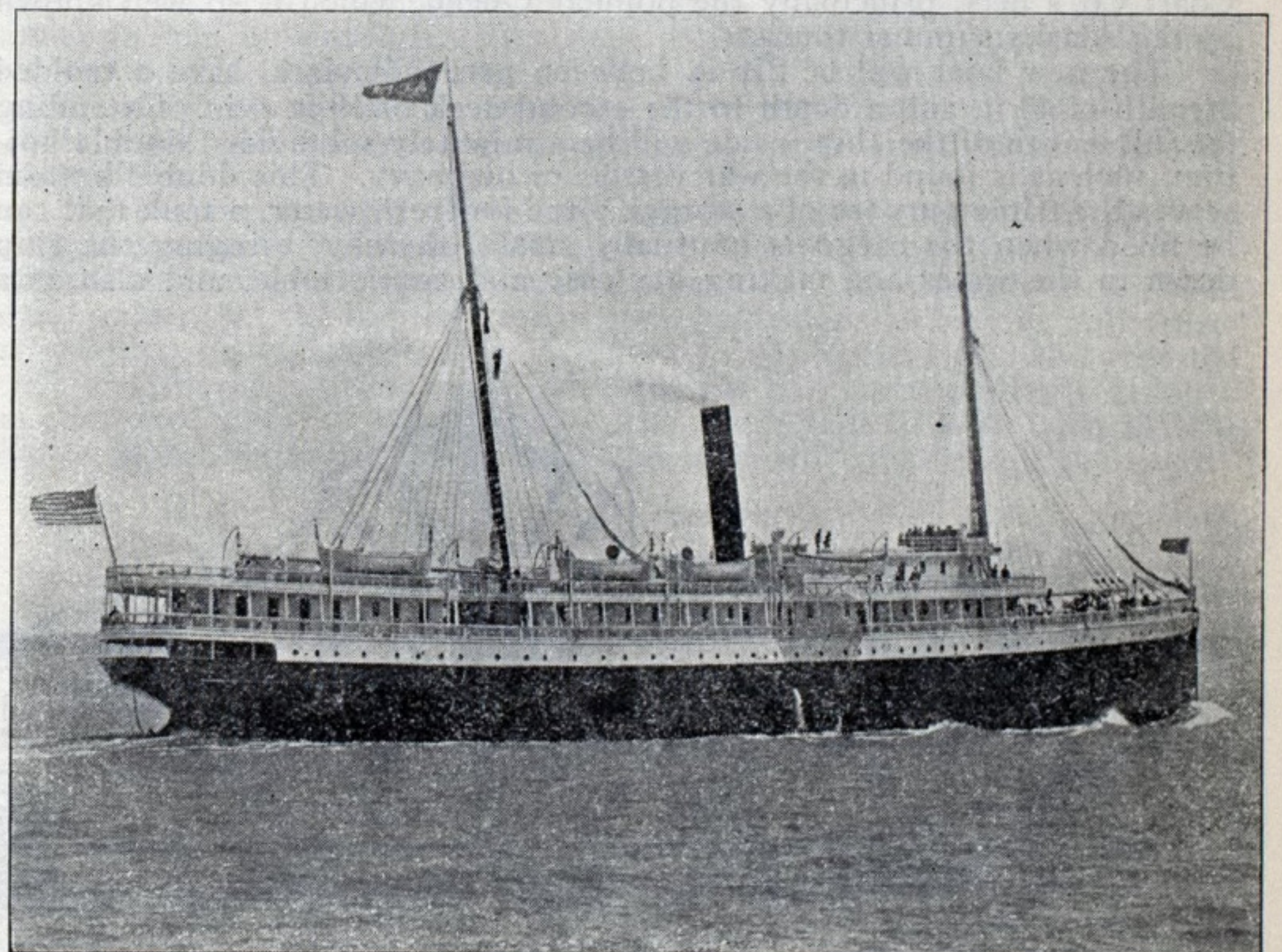
For handling the ship herself two heavy steam capstans have been fitted, one forward and one aft. On the weather or shelter deck amidships, around the funnel and engine casing, are grouped the officers' rooms. On top of this house forward will be the wheel house and flying bridge. The vessel is fitted with skeleton rail from the bow to the stern,

with the exception of a short length of steel bulwark in the wake of the deck house. The hand steering gear is located on the shelter deck aft, and is housed within a steel house, the steam steering gear being located in the after end of the engine room, the leads from the engine going in a straight line without bends to the tiller quadrant. Forward two heavy steel breakwaters are fitted to break up and take care of seas coming over the bow. A powerful steam anchor windlass will also be fitted, stockless anchors.

Going below we find this vessel fitted with three complete steel decks, the shelter, the upper and the main deck. In No. 1 hold forward we have an extra deck, the orlop deck, fitted below the main deck. Fore-and-aft the vessel is divided into nine compartments by eight transverse watertight steel bulkheads, extending from the top of the double bottom to the under side of the shelter deck. The space between the forward bulkhead and the stem, and the after bulkhead and the stern being fitted as peak tanks in the usual manner, the upper portion of which will be used as store rooms, the store rooms being divided from the tanks proper by a watertight flat. Just forward of the forward peak bulkhead a chain locker is located. A deep tank will be fitted for either cargo or water ballast, just forward of the cross bunker. The vessel is fitted with a complete double bottom from stem to stern, divided into nine compartments by eight transverse watertight bulkheads. The stem and stern frame are made of the best forged scrap iron, with scantlings as required by the classification rules. In the lower end of the stern frame a small well is worked to allow the free access of water to the wheels. The shaft brackets are of the spectacle type, cast in one piece of steel, and worked into the form of the vessel, with flanges on each side, which secure them to the stern post with through rivets. A refrigerating machine of ample capacity for the use of the ship's company is provided. A large evaporating and distilling plant is also to be fitted, the evaporating plant to have a capacity of 40 tons of fresh water in every twenty-four hours, and the distilling plant to have a capacity of 2,500 gallons for every twenty-four hours, which will deliver to the fresh water tanks.

THE ALASKAN'S MOTIVE POWER.

Turning to the motive power of this vessel, we find two sets of four-cylinder quadruple expansion engines, supplied with steam from three



**Steamship Senator for Pacific coast trade. St. Paul
is a sistership.**

Built by Union Iron Works, San Francisco.

Scotch boilers fitted with the Howden hot air forced draft, the fans for this system being driven by two Union Iron Works compound single valve engines. These engines when working at full power are designed to develop 3,000 H.P. and give a speed loaded of from 10 to 10½ knots. The high and first intermediate pressure cylinders are entirely separate and free from the low and second intermediate cylinders, thus allowing for expansion between the cylinders. The designed working pressure of the

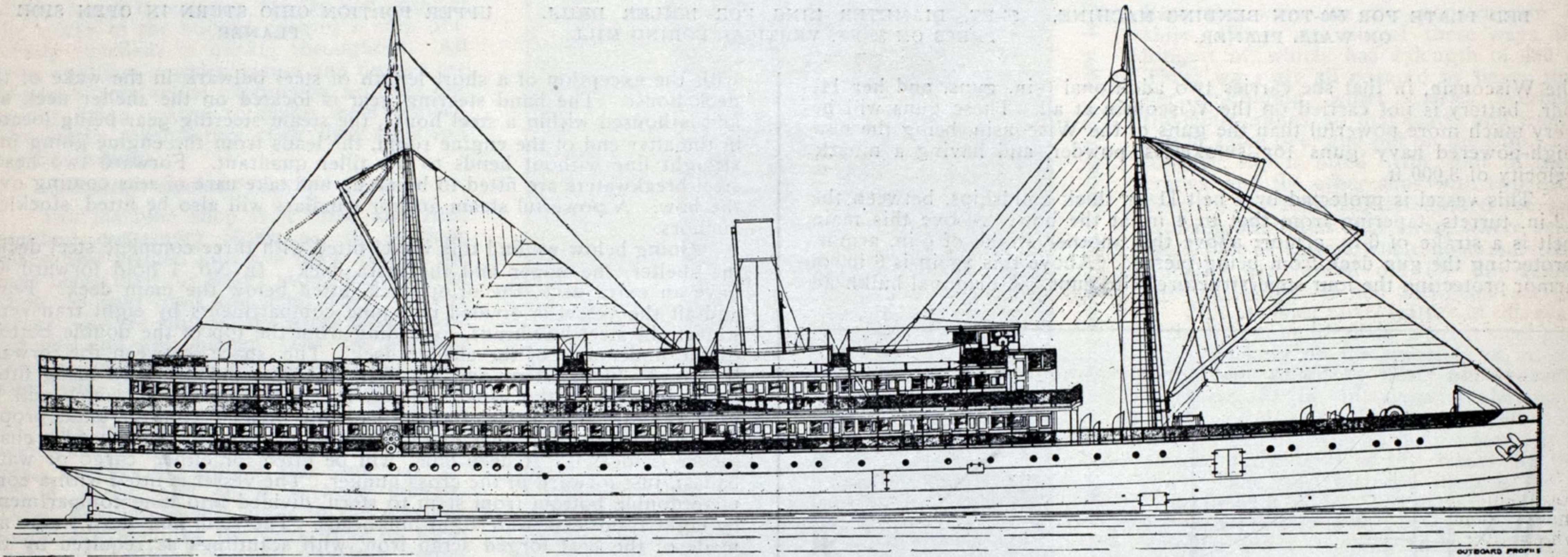
boilers is 212 lbs. The shafting throughout is of Bethlehem fluid compressed steel, the crank shafts being in four sections and interchangeable, placed 90° apart. Between the thrust shafts in the after end of the engine room the electric generating plant is to be situated, which will consist of two dynamos of ample capacity for the lighting and electric power of the ship, driven by two automatic Union Iron Works compound electric light engines; the main engines to be fitted with the usual two cylinder turning engines for use in port. The circulating pump to be of ample capacity to condense the steam from the main engines, and will be driven by compound engines. The usual outfit of ballast, fire and sanitary pumps will be carried. Located in the engine room will be a large electrically-driven ventilating fan, with ducts leading to the different holds throughout the vessel for insuring a supply of fresh air under all conditions, to the different holds.

SPECIAL FEATURES EMBODIED IN THE STEAMER SPOKANE.

A description of the Spokane, the vessel building for the Pacific Coast Co., will no doubt be interesting on account of the many special features embodied in this vessel, and the high requirements and severe governing conditions. The Pacific Coast Co. has building by the Union Iron Works

supply of fresh meat and vegetables for the passengers. A cold storage room is also provided on this deck for perishable cargo. This room runs clear across the ship from side to side, and is 12 or 14 ft. Forward on this deck we have a baggage and store room.

The next deck that we come to is the saloon deck, and on which is located the first and second-cabin dining saloons, the first and second-cabin pantries, bath rooms, and lavatories, the mail rooms and apartments for mail clerks, stewardesses, and numerous other members of the ship's company. The only state rooms on this deck are the second-cabin rooms forward, which are grouped around the dining saloon of the same class, the saloon being arranged to seat thirty-two people. Aft of the engine spaces as mentioned above, and extending clear across the ship, we have the first-cabin dining saloon, which will be one of the features of the ship, extending as it does up through two decks, through the social hall, and a large light trunk having large windows giving on the lower awning deck, and containing handsome stained glass. This dining saloon will contain ten tables with seating capacity for the first-cabin passengers. The tables in this saloon are set athwartships, as in the average Atlantic liner. Rising from the forward end of the dining saloon, which will be handsomely finished in hardwood, will be the grand staircase, also of hard-



Steamship Spokane for Pacific Coast Trade.

Built by Union Iron Works, San Francisco.

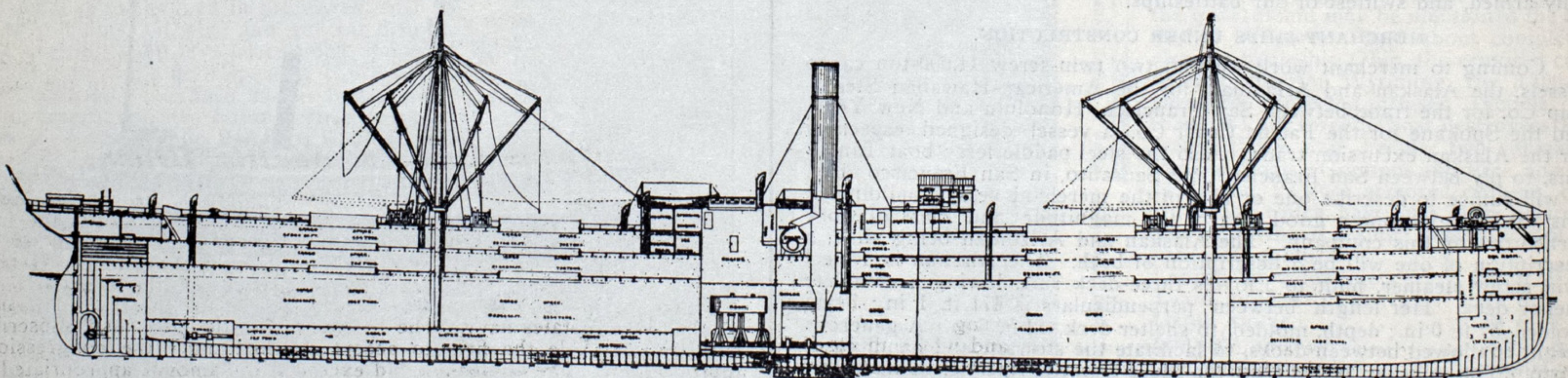
a special steamer for the Alaskan passenger service. This steamer is not meant to cater to the wild rush of impatient gold seekers which crowds the Alaska steam and sailing fleet each spring, but rather to the health-seeking and nature-loving tourist who has both time and means to take things quietly, and who wishes the maxim of comfort with the minimum of effort. The steamer referred to has been designed with this end in view solely, and is strictly a passenger vessel. The vessel, which should be running next spring, is a steel, hurricane-deck, screw steamer, built to the highest requirements of the American Bureau of Shipping. The vessel will resemble in appearance some of the other steamers of the Pacific Coast Co.'s fleet, principally the popular Queen, which is so well known by the Alaska summer tourist.

The new boat will be 270 ft. between perpendiculars, have a molded breadth of 40 ft. and a depth to the second deck of 19 ft. 6 in. Extending the full length of the ship inside will be a minutely subdivided double bottom, such as is found in the war vessels of our navy. This double bottom serves the triple purpose of a storage place for fresh water, a tank that can be filled when the cargo is unusually small, thereby bringing the ship down in the water and making her easy and comfortable, and also as a

wood, polished. This stairway leads to the social hall, which is finished in hardwood also, and fitted with comfortable lounging seats and tables. The social hall being situated on the upper deck, a fine view of the surrounding scenery is obtained through the large plate glass windows. This tier of deck houses, and the one above it, contain all of the first-class cabins. Some of these are arranged in suites to accommodate six people, so that they can be taken by a family. A part of these suites are arranged with bath rooms. All of the rooms are fitted with wash stands, mirrors, clothes lockers, etc. The after end of this deck house is taken up with a large gentlemen's smoking room and lavatory. Forward on this deck, which is the weather deck, is located a powerful steam anchor windlass and two steam winches, which work the forward cargo hatch.

NOVEL FEATURES OF CONSTRUCTION.

A rather novel arrangement has been adopted in regard to the hatch leading to the after hold. As ordinarily arranged, this hatch would lead down through the first cabins, crowding them, and breaking up the full sweep of the dining saloon. To obviate this, two side hatches have been worked to the after hold, leaving the center of the ship entirely clear. To



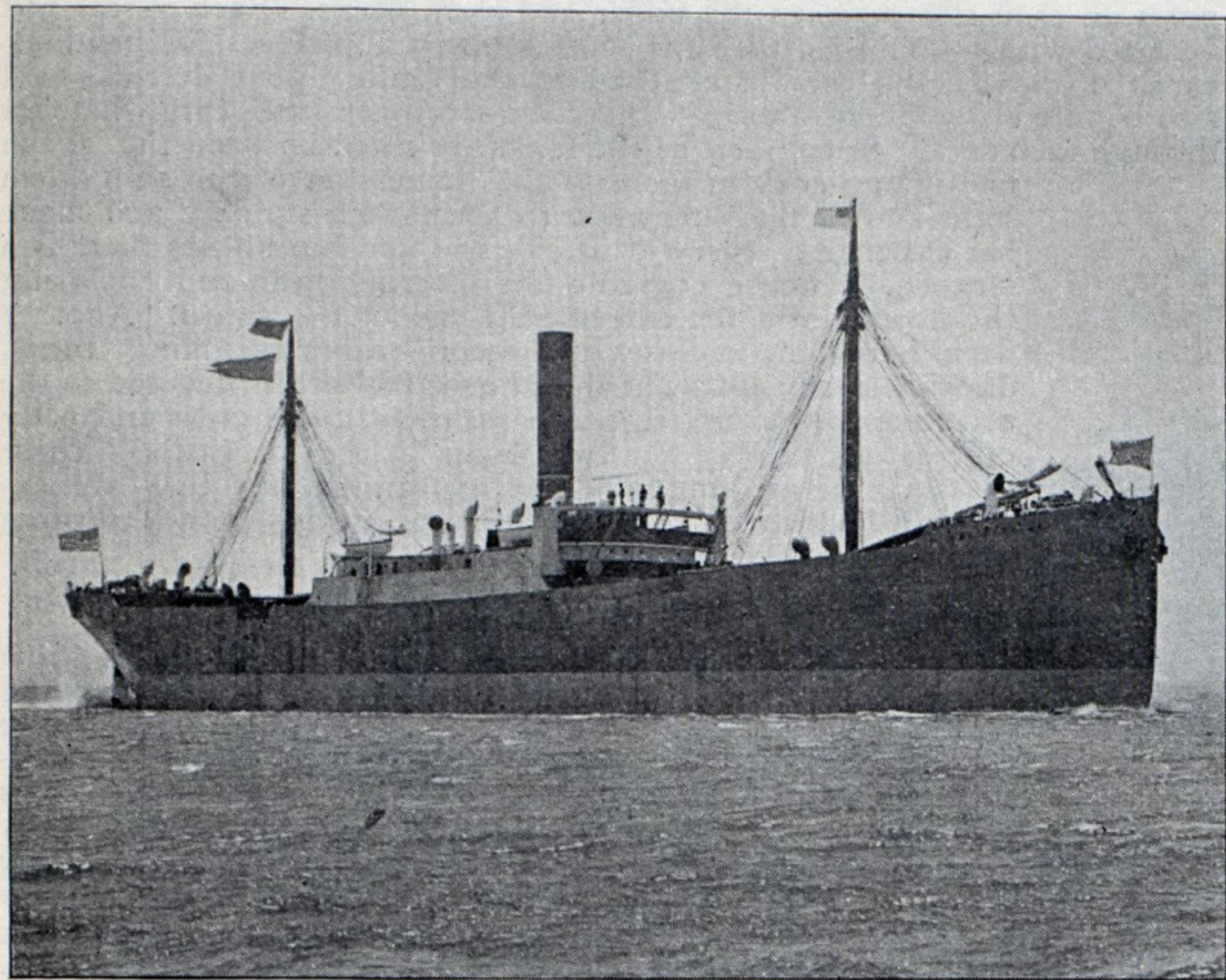
Outboard profile of Alaskan and Arizonian, freight carriers for American-Hawaiian steamship service.

Built by Union Iron Works, San Francisco.

protection against loss by grounding, as it is hard to conceive of an accident that would rupture both the outer and inner skin of the double bottom and let the water into the hold of the ship. But such has been the care in designing this ship, that to guard against this unlikely contingency even, the hull of the vessel up to the saloon deck has further been divided by six water-tight steel bulkheads running right across the ship. The lower and saloon decks of this vessel are complete steel decks, insuring great structural rigidity. Below the lower deck are the cargo holds and coal bunkers, which contain the 500 tons of coal necessary to run the ship. Between this deck and the next deck we find more cargo and coal space, and the large refrigerating and cold storage rooms, fitted to maintain a

prevent the disagreeable noise and heat incident to steam winches at these after hatches, electricity has been substituted, thereby insuring a noiseless and cool winch. The same is true of the capstan located aft on this deck. The next deck above also carries a tier of first-cabin rooms. The most novel feature of this vessel is located in the after end of this row of deck houses. This is a spacious observation saloon about 32 by 20 ft., finished up in hardwood and fitted with lounges, tables and all the appurtenances of comfort. This great height of this observation saloon from the water allows large plate glass windows to be fitted, so that in rainy and windy weather an unobstructed view from a sheltered position can be obtained in all directions except directly ahead. A light shade deck is fitted over

this tier of deck houses, which accommodates the sixteen boats and life rafts carried, and affords a spacious promenade and lounging place for the passengers. This space is still further increased by the deck directly below, which has passages alongside the deck houses, amply wide to accommodate steamer chairs, and still leave a space for walking. As the vessel is handled from the deck below this one, the two upper shade decks



Steamship Californian for American-Hawaiian Steamship Co.

Built by Union Iron Works, San Francisco.

will always be free for the use of the passengers, even when the ship is docking. At the forward end of the upper tier of deck houses the pilot house and captain's room are located. Above this pilot house is the bridge shelter, a special feature always fitted in the Pacific Coast Co.'s boats, and which affords a protection against the weather for the officers navigating the vessel.

THE SPOKANE'S MACHINERY.

The machinery of this vessel will be no less complete than the hull, and will represent the most advanced practice in marine engineering. The propelling machinery will consist of a set of triple expansion engines developing 2,500 H.P. and having cylinders 23½, 40 and 66 in. diameter, with a stroke of 42 in., giving a speed of about 14 knots. The shafting of the vessel will be of steel, driving a built-up bronze wheel, insuring great strength and practical immunity from broken shafts and wheels, sources of delay and discomfort, and even danger in so many steamers. Steam will be supplied to these engines and the ship by three Babcock & Wilcox water tube boilers with a working pressure of 225 lbs. per sq. in. Forced draft will be fitted to the boilers, air being supplied by two compound blower engines, large bearing surfaces and efficient lubrication being given particular prominence in their design. That there may always be an efficient supply of fresh water for the ship and machinery, an evaporator having a capacity of 15 tons of fresh water every twenty-four hours will be installed. A powerful fire pump will be installed in the engine room, with its mains running to every part of the ship, which pump has ample capacity to deal with any fire that might start on the vessel.

The electrical equipment will be the most complete ever installed on the Pacific coast. There will be about 300 incandescent lamps distributed about the ship, thoroughly illuminating every part. The side lights and the mast-head lights will also be fitted with electricity. A powerful search-light will enable the ship to make a dangerous harbor as well by night as by day. Electric fans in the dining and observation rooms will insure a cool and comfortable atmosphere, even in the hottest of weather. For handling the cargo there will be two powerful electric winches, in addition to the steam ones, each with a lifting capacity of 3,000 lbs. At the stern will be located an electrical capstan for use in hauling the ship. Power for the electric lights will be furnished by two generators located in the engine room and direct-connected to high speed automatic compound engines, the design of the apparatus being such that no matter how little or great the demand for electric current, the machinery will automatically supply it. The current from the generators is distributed throughout the different parts of the ship by different feeders, each supplying its own section and being directly under control of the engineer by means of the switch board, located near the generators. The switch board is equipped with all the necessary switches, safety devices and indicating instruments, which show at a glance the amount of current in use, and which in case of trouble on any one of the circuits, will automatically cut out that circuit without interfering with any of the others. Large portable reflectors, each fitted with a cluster of incandescent lamps, permit the ready handling of cargo by night. A complete system of electric bells and annunciators, connecting every part of the ship with the steward's department, assures that every want of the passenger will be immediately attended to. Everything that modern electrical science and workmanship, together with the best of material, can do, has been done to render this the most complete and perfect installation of its kind ever placed in a vessel of the merchant marine on the Pacific coast.

From the above it will be seen that the Pacific Coast Co., in this steamer, will have a vessel that is almost unique in the coast passenger service of this country, and it is probable that there is no more complete or luxurious vessel building or running anywhere, either in this country or abroad. The fact that the vessel is being built by the Union Iron Works is the best indication that the design will be conscientiously carried out,

and that the work will be of the best, and that the vessel will be complete in every particular.

LIST OF WAR VESSELS BUILT AND BUILDING BY UNION IRON WORKS.

Name	Description	Length on W. L.	Breadth, extreme	Depth, molded	Draught
Charleston	Cruiser	312'7"	46'2"	32'6"	18'7"
San Francisco	Cruiser	310'0"	49'2"	32'9"	18'9"
Monterey	Monitor	256'0"	59'0¼"	17'0"	14'10"
Olympia	Cruiser	340'0"	53'0½"	35'10"	21'6"
Oregon	Battleship	348'0"	69'3"	35'0"	24'0"
Wheeling	Gunboat	174'0"	34'0"	21'9½"	12'0"
Marietta	Gunboat	174'0"	34'0"	21'9½"	12'0"
Farragut	Destroyer	213'6"	20'7¾"	13'3¾"	6'0"
Wisconsin	Battleship	368'0"	72'2½"	34'6"	23'6"
*Chitose	Cruiser	396'0"	49'2"	29'2"	17'6"
Ohio	Battleship	380'0"	72'2½"	34'6"	23'6"
Wyoming	Monitor	252'0"	50'0"	14'10½"	12'6"
Paul Jones	Destroyer	245'0"	23'7"	14'3"	6'6"
Perry	Destroyer	245'0"	23'7"	14'3"	6'6"
Preble	Destroyer	245'0"	23'7"	14'3"	6'6"
Tacoma	Cruiser	292'0"	44'0"	22'11¼"	15'9"
Grampus	Submarine boat	63'4"	11'9"	completely submerged	
Pike	Submarine boat	63'4"	11'9"	completely submerged	

Two 15,000-ton, 22-knot armored cruisers, 502' long, 23,000 I.H.P.

*For imperial Japanese navy; all others for United States navy.

PRINCIPAL MERCHANT VESSELS BUILT AND BUILDING—UNION IRON WORKS.

	Length between perpendiculars	Breadth, molded	Depth, molded	Dead weight, tons	Indicated horse power	Speed, knots
Peru	344'0"	45'0"	28'10"	3000	2681	15
Californian	413'0"	51'0"	33'6"	8000	2250	19
Alaskan	469'0"	57'0"	35'0"	11000	2600	10
Arizonian	469'0"	57'0"	35'0"	11000	2600	10
Spokane	270'0"	40'0"	19'6"		2500	14

Change of Appropriation for Battleships.

Secretary Long has found it necessary to recommend a revision of the figures set by congress for the construction of battleships and armored cruisers. As a result of the recent bidding and after extensive conferences with the ship builders, he has sent the following letter to the chairmen of the house and senate committees on naval affairs:

"I have the honor to invite attention to the limit of cost fixed by the acts of March 3, 1899, and June 7, 1900, for battleships at \$3,600,000 each, and for armored cruisers at \$4,000,000 by the former act, and \$4,250,000 by the latter, and to state that from the last bidding for the construction of such vessels, proposals opened Dec. 7, 1900, it appears that the limit for battleships, \$3,600,000, is too low to enable the department to procure vessels of that type of the best and most modern design as contemplated by said acts, and that \$4,250,000 is somewhat more than is needed for the armored cruisers.

"While the department received bids for the two unsheathed battleships under the act of June 7, 1900, well within the limit of cost prescribed, namely, at \$3,405,000 each, it is inclined to believe that this figure is lower than could be expected ordinarily for similar vessels, the same having been submitted by a new firm bidding for the first time on battleships. The proposals of responsible bidders upon the battleships authorized under the act of March 3, 1899, range from \$3,580,000 to \$4,200,000 for a single vessel, and at the lowest of these prices it would be impossible to build the vessels within the legal limit if the parts to be furnished by the government and not included in such price were supplied as originally intended.

"It is recommended, therefore, in order that the vessels of this important class may be constructed upon the most efficient plans, and without the necessity of omitting features that might in emergency prove of great value, that the limit of cost of such battleships as may be authorized at this session of congress be increased to \$3,850,000 each, and that the cost of armored cruisers to be provided for be correspondingly reduced as compared with the price named in the act of June 7, 1900, from \$4,250,000 to \$4,000,000 each. In this way the total will still remain the same."

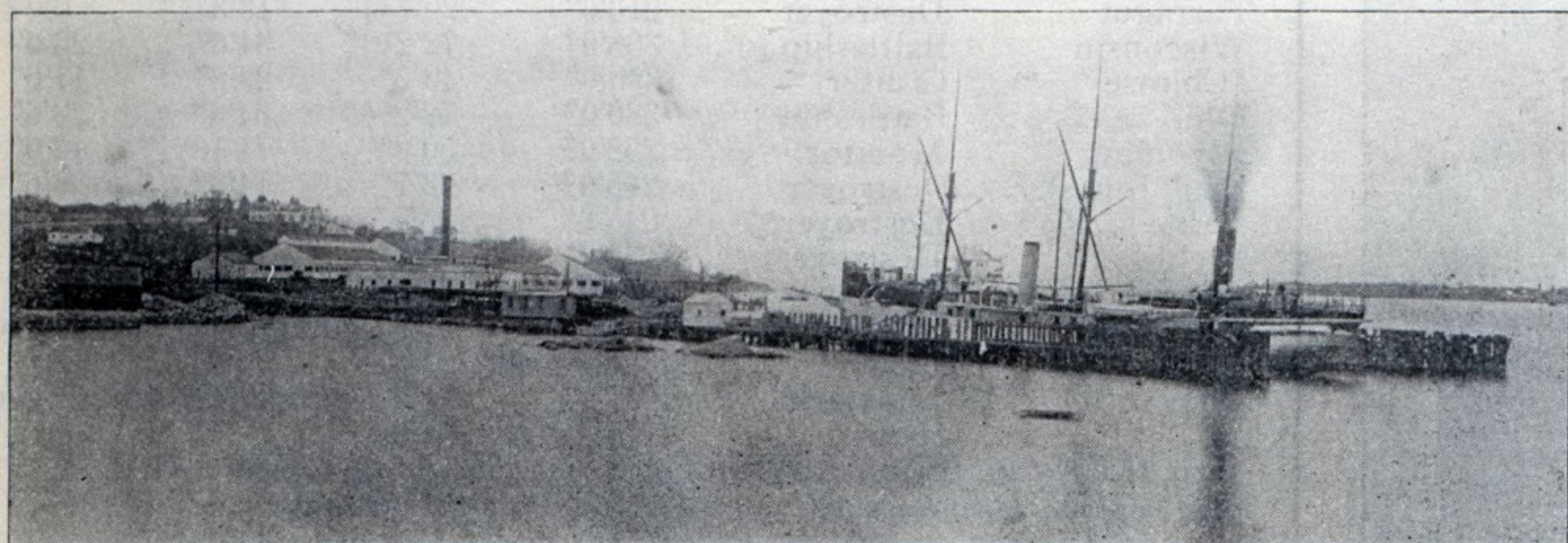
Moran Bros. Co., Seattle, Wash.

Among the progressive Pacific coast builders is the firm of Moran Bros. Co., Seattle, Wash. They have at present on the stocks the four-masted schooner James Johnson, 231 ft. long, for the Pacific Clipper line of Seattle, Wash.; the twin-screw steel, steam light-house tender Heather for service in the thirteenth light-house district, off the Oregon coast, and have just been awarded a contract for one of the sheathed battleships for the United States navy. The citizens of Seattle generously subscribed \$100,000 to enable the firm to accept the bid under the congressional appropriation. The company's bid exceeded the amount appropriated by congress for the construction of the battleship. Moran Bros. Co. are the second firm to construct battleships on the Pacific coast.

Bids for raising the wreck of the United States battleship Maine were opened in Washington last week. There were twelve bidders, whose offers ranged from \$867,000, the bid of the Swartz Foundry Co. of New Orleans, La., to the proposal of Chamberlain & Co. of Chicago to remove the wreck for nothing and give the government 3 per cent. on the sales of the material in the form of souvenirs. The variety of plans for raising the wreck is no less astonishing than the difference in the bids. One contractor proposed to raise it by means of a balloon. Several suggested novel schemes, involving cofferdams, and others named pontoons and air bags as lifting contrivances.

Eastern Ship Building Co., New London, Conn.

THE most interesting vessels at present undergoing construction in the world are the two mammoth steamships for the Great Northern Steamship Co., James J. Hill, president, which are being built by the Eastern Ship Building Co., Charles R. Hanscom, president, at New London, Conn. These vessels are of particular interest for many reasons. They are the largest vessels designed or built up to date. They are an American production throughout, designed by an American and built by an American for an



Site of Eastern Ship Building Co.'s new plant at New London, Conn.

American steamship company. Then, too, the builders, instead of following in well-beaten tracks, are making many interesting innovations in the construction of these ships; and it may be said further that Charles R. Hanscom, president of the Eastern Ship Building Co., contracted for these vessels, the largest in the world, before he had a yard to build them in, or even a plot of land decided upon as the site of his new ship yard. A contract involving an expenditure of several millions of dollars for the construction of such tremendous vessels, secured by a competent and enthusiastic ship builder as the first contract for his new ship yard—at that

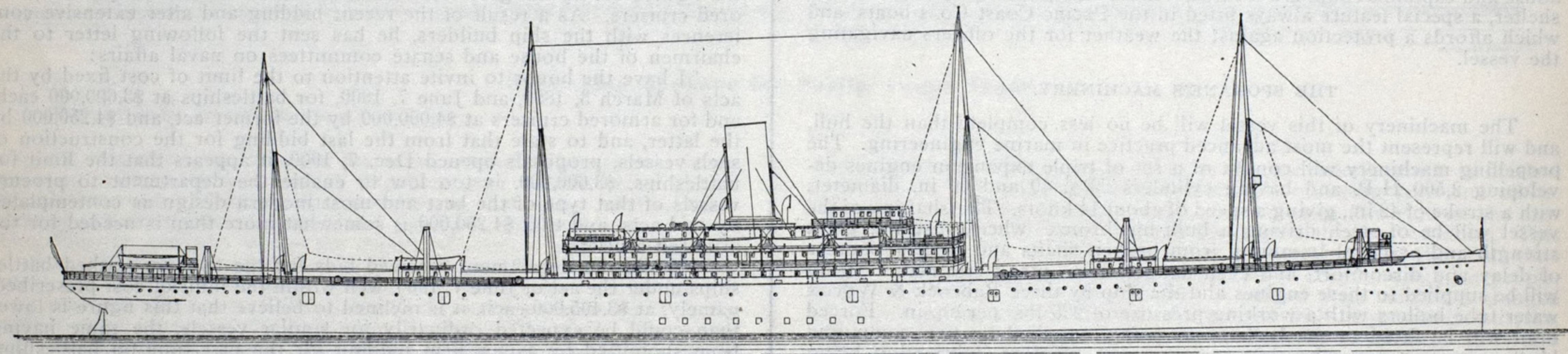
more. All the coal is carried above the level of the boilers. The holds are fitted for the carrying of frozen meat in the refrigerating chambers, fruit, and every conceivable kind of cargo. There are nine large cargo ports on each side between the upper and main decks. Each vessel will be fitted with four masts, with the most modern appliances for handling cargo efficiently and rapidly attached to the same. Vent derricks will also be fitted to good advantage. There are seventeen large cargo hatches through each deck. Deep water ballast tanks are fitted between the 'tween and main decks to increase the immersion of the ship when light and at the same time to strengthen stability and make her easier in a sea-way. Beside the midship houses there is a large deck house covering the steering gear and enclosing the hospitals in the extreme aft end of the vessel. Another deck house aft encloses the second cabin smoking room, drawing room, etc. The deck house forward is devoted to the accommodation of steerage passengers. The crew and petty officers are berthed on two decks in the forecabin. These vessels have an unusually fine appearance and they are extremely handsome, besides having a decided money earning and business-like appearance.

MACHINERY, PASSENGER ACCOMMODATIONS, ETC.

The machinery of these ships consists of two sets of triple expansion vertical engines, driving twin screws, each being located in a separate water-tight compartment. These engines are being manufactured by the Midvale Steel Co. of Philadelphia, and are of the finest material that it is possible for this well-known firm to produce. Steam will be generated by sixteen Niclausse boilers in each vessel, having an aggregate grate surface of 1,000 sq. ft., with a heating surface of 40,000 sq. ft. and a pressure of 250 lbs. These boilers are being manufactured by the Stirling Co. of Barberton, O., who have the exclusive right to manufacture the Niclausse boilers in this country. Each vessel will be provided with an elaborate outfit of pumps, auxiliaries, and many approved interesting labor saving devices. They will have a speed of about 14 knots per hour.

Although these vessels are primarily cargo carriers, they will have

Largest Cargo Carriers in the World.



OUTBOARD PROFILE OF THE TWO MAMMOTH STEAMSHIPS BUILDING AT THE EASTERN SHIP BUILDING CO.'S WORKS, NEW LONDON, CONN., FOR THE ORIENTAL SERVICE OF THE GREAT NORTHERN RAILWAY.

time only visionary—is a remarkable and, up to this time, an unheard of event.

These new vessels are to carry the products of American mines, manufacturing and western farms, distributing them in the orient, making a new market of great extent, from which comes already a great demand. They will be somewhat similar to the modern Atlantic liner of the intermediate type. They are primarily cargo vessels and are designed to carry a vast amount of freight at a moderate speed with low running expenses. These ships will have a gross tonnage of over 20,000, with a displacement, or total weight loaded, approaching 33,000 tons. The gross tonnage of the Deutschland, the present greyhound of the Atlantic, and probably the most-talked-of vessel at this time in the world, is 16,000 and her displacement 23,000 tons, or 10,000 tons less than the mammoth Hill steamships. The gross tonnage of the Oceanic, at present the largest vessel in the world, is 17,000; the Kaiser Wilhelm der Grosse, 14,349; the Ivernia, 13,799; the Pennsylvania, 13,726 tons; Minnehaha and the boats now building at Sparrow's Point, Md., 13,750; Campania, 12,950; the new Cramp International liners, 12,500; and the new Pacific Mail steamship Siberia, built at Newport News, Va., less than 12,000 tons. These figures will give an approximate idea of the tremendous size of the vessels building at New London. Although much larger than any vessels built or projected, the new Great Northern steamships are of shorter length than many of the fastest and largest greyhounds. What they lack in length they make up in beam and depth. It is understood that the length was determined by the limiting dimensions of the docks on the Pacific coast.

These new ships are 630 ft. long, 73 ft. beam, and 55 ft. deep. They will draw about 33 ft. of water, the maximum that harbors will allow, but they are of such proportions and strength that if ever the harbors are dredged to admit them, the draught can be greatly increased. These vessels have five continuous decks, with three partial accommodation decks amidships. They have thirteen transverse water-tight bulkheads. The main hull of the first ship is divided into twenty-six water-tight compartments, and the double bottom is divided into twenty-eight

unusually large and fine accommodations for passengers. About 200 first-class cabin passengers will be carried amidships, about 100 second-class passengers just abaft the machinery space on the main deck, 200 third-class passengers forward of the machinery space on the main deck, and about 1,000 steerage between the third class and the crews' quarters forward. The first and second-class state rooms will be unusually large and airy, with no more than two berths in each room. All the first-cabin



Water front of the Eastern Ship Building Co.'s plant at New London, Conn.

state rooms are outside rooms, entered by side passages, with berths on the inboard side and sofa on the outboard side of the rooms. The first-class passenger accommodation includes a large dining saloon, capable of seating all the first-class passengers, also a large drawing room, smoking room, library and nursery. Adjoining the smoking room is a very convenient barber shop and bar. Several of the state rooms have private bath rooms adjoining, and there are also a few suites of three rooms, con-

sisting of state room, sitting room and bath room. The second-class passengers have a large airy dining room, comfortable ladies' drawing room, gentlemen's smoking room, likewise fitted with bar and barber shop.

The complement of the vessels will consist of about 200 men each, the officers being located on the upper deck abaft the galley and around the engine casings, the petty officers being forward. The after part of the main deck will be fitted up for the carrying of cattle, but both the cattle fittings and the steerage berths forward will be portable, so as to be removed to enable these holds to be filled with general cargo, if desired.

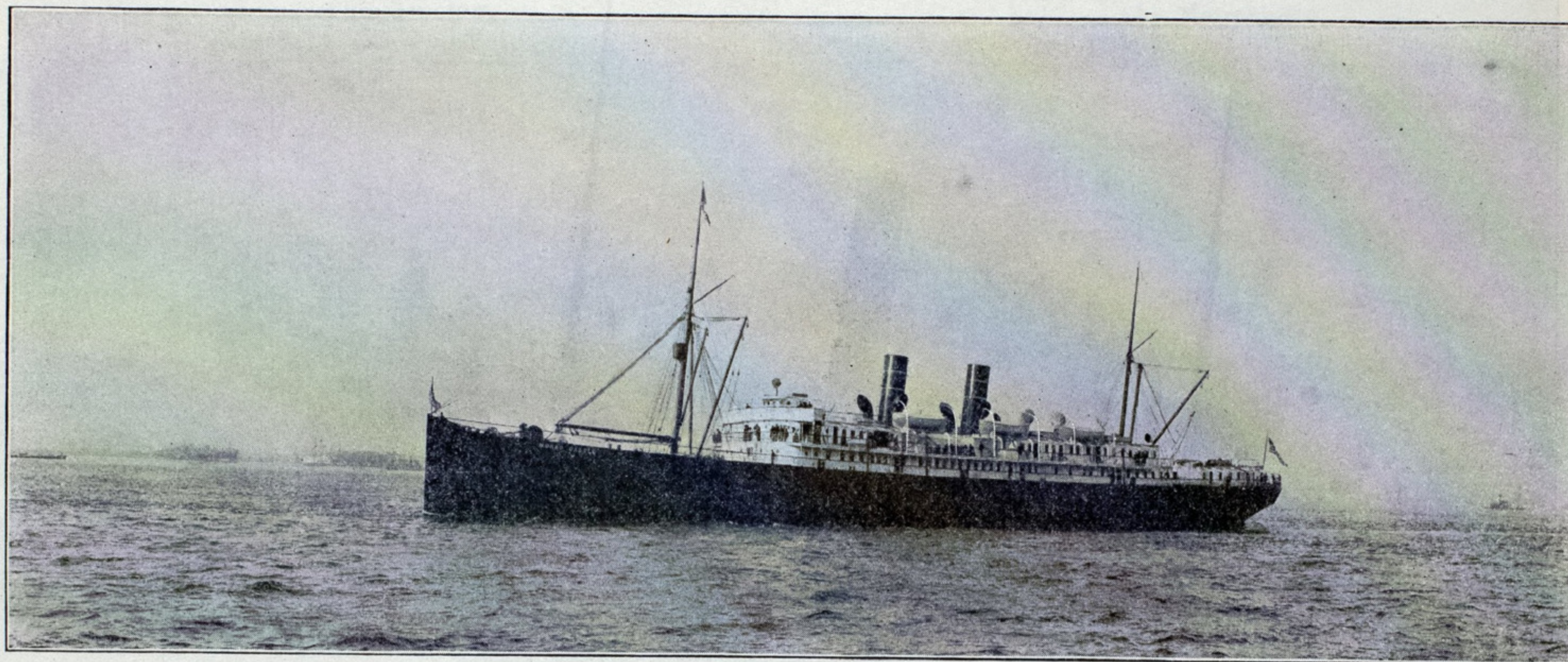
The vessels carry about 8,000 tons of water ballast, and about 5,000 tons of coal, the holds having cubical capacity sufficient to carry about 26,000 tons of coal. The dead-weight capacity of these vessels is stated at about 20,000 tons. They will cost in the neighborhood of \$2,500,000 each. The keels are already laid for a length of about 400 ft., and the vertical keels, floors and longitudinals are now being rapidly erected. The first vessel will probably launch about March, 1902, the second vessel following soon after.

THE EASTERN SHIP BUILDING CO.'S PLANT.

The Eastern Ship Building Co., builders of the vessels just described, have recently completed the first stage of the erection of a very interesting plant for the construction of steel ships of every type. Although this yard has been planned to be of capacity sufficient to construct the largest vessels in the world, yet the number and floor space of its shops and amount of money expended is much smaller than that of some other American ship yards, principally owing to the fact that the company has decided, for the time being, to sublet orders for the machinery of vessels that they contract to build. At this time there are no large machine shops, boiler shops or foundries at the New London works, the plant consisting of a number of efficient and well-arranged buildings fitted to economically and rapidly construct the hulls complete, of vessels of every type. The promoters of this company apparently believe that there is economy in specializing, and that by following a plan that has already found favor in

Morro Castle, Ward Line Steamship.

Among the handsome steamships turned out during the year, the Morro Castle, built for the New York & Cuba Mail Steamship Co. (Ward line) by the William Cramp & Sons Ship & Engine Building Co., must be included. This excellent vessel went into commission during the fall of 1900 and has already beaten the record of the Havana and Mexico, which are employed by the Ward line in the coasting trade between New York and Havana. The Morro Castle has exceeded her requirement of a sustained sea speed of over 18 knots per hour. The general dimensions of the vessel are as follows: Length on load water line, 400 ft.; breadth, molded, 50 ft.; depth, 36 ft. 6 in.; gross registered tonnage, 6,004; net tonnage, 3,732; displacement at load draught, 8,280 tons; deep load draught, 21 ft.; light draught forward, 8 ft. 10 in.; light draught aft, 15 ft. 7 in.; light draught, mean, 12 ft. 2½ in.; capacity of bunkers, 915 tons. The hull is subdivided by six water tight compartments. In the construction of the vessel only the best of steel was used. The frames are of bulb angle steel, 7 in. by 3½ in. by 20 lbs., carried up alternately to the hurricane and main decks from stern to within 60 ft. of stem, forward of which all frames are carried to hurricane deck. The frame spacing is 24 in. The main, lower and orlop decks are completely of steel, while the hurricane and shade decks are of wood with steel stringers, tie plates and margin plates. The vessel has a double bottom for nearly her entire length, which not only affords additional protection in case of grounding, but can be utilized for carrying water ballast or a fresh water supply for the boilers. The capacity of the trimming and double bottom tanks are as follows when filled with salt water: Forward trimming tank, 121 tons; after trimming tank, 165 tons; double bottom compartments, 746 tons; total, 1,032 tons. The vessel can be converted into an auxiliary cruiser on a few hours' notice. Special strengthening and foundations are provided to carry three 6-in. guns on the hurricane deck, and eight 6-in. guns on the main deck. The arrangements of the upper deck are such that an efficient secondary battery can be easily installed. The hold spaces are very large and magazines in the immediate vicinity can be easily and expeditiously



Steamship Morro Castle, for the Ward Line.

Built by the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia.

Europe they can buy machinery auxiliaries, various types of fittings, and articles of equipment for the vessels that they build from companies that make a specialty of each of these items at a price much cheaper than it would cost to produce the same articles themselves. The ship yard covers a plot of land of about forty acres, well located at the old Groton terminus of the New York, New Haven & Hartford Railroad. The railroad facilities are ideal and the water front of almost a mile in extent is unrivalled in the country. The works are located within two miles of the mouth of the Thames river, and a channel with a minimum depth of 65 ft. approaches the works.

The buildings at this time include a plate shop 80 ft. wide, containing every variety of heavy steel working tools, manufactured by Hilles & Jones Co., Hill, Clarke & Co., the Niles Tool Works Co. and the Cleveland Punch & Shear Works. All these tools are operated by steam. A large Ingersoll-Sargeant air compressor is located in the north end of the shop and furnishes power for the pneumatic tools used in the construction of the vessels. The boiler house and blacksmith shop is a brick building containing four boilers of about 1,000 H.P., manufactured by the Erie City Iron Works. The plate and angle furnaces are of large size, opening onto a bending floor about 80 ft. long and 50 ft. wide. A large three-story building, 250 ft. long and 70 ft. wide, contains the carpenter shop, joiner shop and mould loft. The joiner shop contains a fine set of quick-running American wood working tools, all steam driven; the pipe and ship machine shop is south of the joiner shop, and is well arranged with modern high-class tools. The office is a three-story building, 70 ft. long and 30 ft. wide, the draughting room being on the third floor. The usual paint shops, rigging loft, store rooms, etc., are located to a good advantage throughout the works. Considerable land is available for stowage. All material coming by rail enters the plant from the south end, and is unloaded and stored by means of locomotive cranes. The arrangement for handling material over the building ways is one of the most ingenious contrivances that has ever been devised. The scheme consists of a series of steel spars, each supporting a yard about 200 ft. long, and a series of cable ways runs upon these yards distributing the material to any part of the ship.

arranged. There is a complete below-water fire main for special use when converted into an auxiliary cruiser, this main having risers to the principal upper compartments. The fire service, which will be used when serving as a merchant vessel, is entirely independent above the water and under the upper deck. There is an efficient pumping system for freeing the ship of water in case of bilging lower compartments, and the vessel is well subdivided into water tight compartments, there being a water tight door on the water tight bulkhead between two fire rooms.

The passenger accommodations are roomy and well ventilated and provide for 136 first-class, sixty second-class and forty-four steerage. The vessel is propelled by twin screws, driven by two vertical, four cylinder, triple expansion engines, making about 8,000 I.H.P. at 100 revolutions with a working steam pressure of 170 lbs. The cylinders are as follows: High pressure cylinder, 32 in., intermediate pressure, 52 in., two low pressure, each 60 in. The propellers are of the three-bladed, solid type, of Parsons manganese bronze of the modified Griffith type. There are eight main boilers of the single-ended return tubular, cylindrical marine type, each 14 ft. 2¾ in. in diameter by 10 ft. 5½ in. There are three Morison corrugated furnaces in each boiler, the same being 39 in. in diameter. The working pressure is 170 lbs. The total grate surface is 442 sq. ft. and the total heating surface 18,200 sq. ft. For forced draft there are four Sturtevant fans. The interior fittings of the steamship are not excelled by anything afloat. The dining room is especially fine, while the distinguishing feature of the ship is the smoking room.

Following are some of the firms who have contributed to the outfitting of the vessel: American Ship Windlass Co., Providence, R. I., windlasses and steam capstans; Williamson Bros., Philadelphia, steering engine; General Electric Co., electric plant; Weston Electrical Instrument Co., ammeters and voltmeters; Page Bros & Co., Boston, running, mast head, stern and anchor lights; Thomas Drein & Son, Wilmington, Del., boats and rafts.

Capt. Thomas Currie of Port Huron, aged fifty years, died on Friday last. He was a member of the Shipmasters' Association of the Great Lakes.

Harlan & Hollingsworth Co., Wilmington, Del.



THE Harlan & Hollingsworth Co., Wilmington, Del., has enjoyed a season of unusual prosperity during the past year and can contemplate the future with considerable complacency. The company has been so rushed with work that it has been forced to assign some parts of it to other ship yards. The character of this company's works is largely merchant vessels of a very high class. One of the best vessels carrying the American flag is the James S. Whitney, which was recently turned out for the Metropolitan Steamship Co., and which is described in detail below. She is the latest vessel turned out by the company. The company has now on hand the following vessels: Torpedo boat Stringham for the United States navy; torpedo boat destroyers Hopkins and Hull for the United States navy; steam yacht Alvina for Charles Fletcher, Providence, R. I.; two ferry boats for the Central Railroad of New Jersey, 207 ft. long each; vessel for C. H. Mallory & Co., 400 ft. long; tramp steamer for Henry T. Knowlton and Amos D. Carver, 321 ft. long; side-wheel ferry boat for the Philadelphia & Reading Railroad Co., 169 ft. long; dredge hull for H. T. Dunbar of Port Colborne, Ont., 100 ft. long.

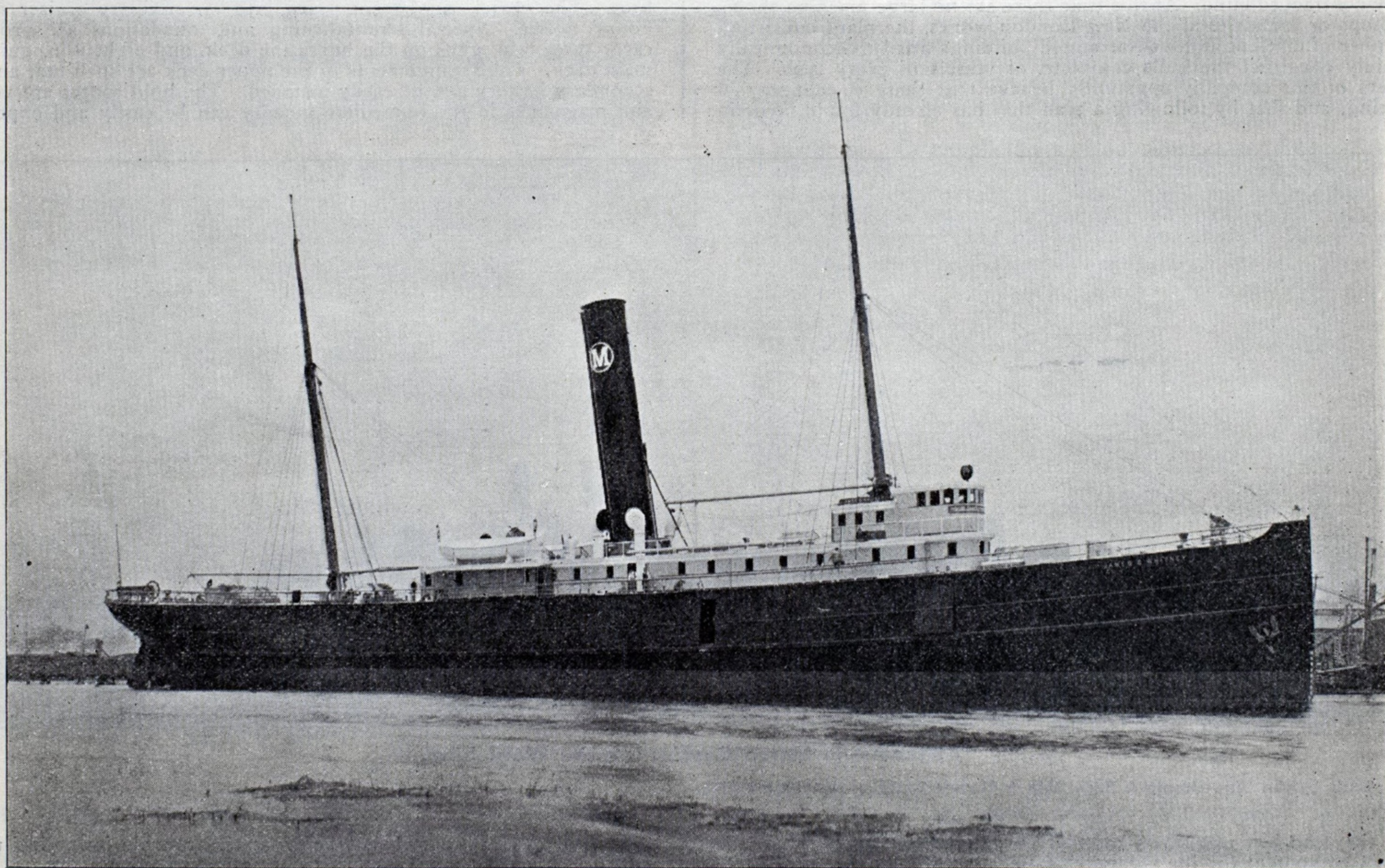
The company completed in the year just past the following vessels: San Juan, for the New York & Porto Rico Steamship Co., 3,503 gross tons; Grecian, for the Boston & Philadelphia Steamship Co., 2,827 gross tons; James S. Whitney, for Metropolitan Steamship Co., 2,707 gross tons;

The dimensions of the Chesapeake are as follows: Length over all, 219 ft.; length between perpendiculars, 205 ft.; beam, molded, 32 ft.; depth to upper deck at center, 23 ft. 3 in. Her motive power consists of one triple expansion, three-crank, surface condensing engine of the open front type, with cylinders of 18, 28 and 45 in. diameter, and a stroke of 30 in., supplied with steam by two Scotch boilers of 11 ft. diameter and 10 ft. length. She is built of steel throughout and has two decks and three side ports on each side; is designed to carry about 900 net tons of cargo, and will develop a speed, when fully loaded, of about 12 knots. There are no passenger accommodations on this vessel. She is built for freight only.

The San Juan, built for the New York & Porto Rico Steamship Co., is designed to carry a maximum amount of freight with small coal capacity and is of the following dimensions: Length over all, 335 ft.; length between perpendiculars, 317 ft.; length on water line, 322 ft.; beam, molded, 42 ft.; depth at center to main deck, 19 ft. 10 in.; depth to spar deck, 27 ft. 8 in.; depth at side to spar deck, 26 ft. 9½ in.; depth to main deck at side, molded, 19 ft.; draught, loaded, 19 ft.; gross tonnage, 3,503; net tonnage, 2,819.

COASTING STEAMER JAMES S. WHITNEY.

The steel coasting steamship James S. Whitney, which has recently been completed for the Metropolitan Steamship Co. of New York, for



The James S. Whitney.

Built by the Harlan & Hollingsworth Co., Wilmington, Del.

Chesapeake, for New York & Baltimore Transportation Co., 1,101 gross tons; Mannahata, for New York & Baltimore Transportation Co., 1,103 gross tons; Harrisburg, Johnston and Wilmington, tug boats for Pennsylvania Railroad Co., 225 gross tons; five barges for Rockland-Rockport Lime Co., 1,120 gross tons each.

DESCRIPTION OF THE GRECIAN, CHESAPEAKE AND SAN JUAN.

The following is a brief description of the Grecian: She is a three-deck freight and passenger steamer, built to rate under the United States Standard Register for seventeen years; tonnage of 2,483.08; length over all, 290 ft.; between perpendiculars, 263 ft. 2½ in.; beam, molded, 42 ft.; depth, 36 ft.; draught, loaded, of 18 to 20 ft.; carrying capacity, about 2,500 tons. In the hull there are four water tight bulkheads, four hatches, four side ports on each side, four single-cylinder Williamson winches, Hyde steam windlass capstan forward and aft, two steel masts, steel deck house with accommodations for about 100 passengers. Machinery and auxiliaries are: Two electric light plants, 200 lights each; 18-in. searchlight; inverted triple expansion engines, with cylinders of 25, 41½ and 66 in. diameter and 45 in. stroke; four 12-ft. by 10½-ft. boilers, each with two furnaces of 40 in. inside diameter, built to sustain a working pressure of 170 lbs.; built-up cast iron wheel of 15 ft. diameter; Ellis & Eaves induced draft. The bunker capacity is 275 tons and the vessel is to make a speed of 15¾ knots on eight hours' trial. There is also a Scotch donkey boiler of 8 ft. by 10 ft.

The Chesapeake was one of the first vessels to leave the ways during the year. Her sister ship, the Mannahata, followed a few weeks later. These vessels are running between New York and Baltimore on what is known as the Shriver line. The Chesapeake was christened by Miss Olivia Brengle Shriver, daughter of Clarence Shriver, president of the company.

freight service between New York and Boston, is an excellent example of a coast freighter. While intended for the transportation of freight exclusively she could readily be transformed into a passenger steamship by adding staterooms on her upper deck. In finish, appointments and general design the Whitney is equal to any of the better class of passenger steamships plying on our coasts. She carries a very high funnel, which serves to give a good natural draft to her furnace fires. Her freight holds are unusually capacious, and every facility is had for the rapid loading and unloading of the vessel. General dimensions of the vessel are: Length over all, 288 ft. 8¾ in.; length from inside stem to fore side rudder post, 278 ft. 5 in.; length between stem and inner stern post, at 10 ft. water line, 270 ft. 5¾ in.; beam, molded, 43 ft.; depth of floors to top of main deck beams at lowest part of sheer, 19 ft.; depth of floors from top of awning deck beams at lowest part of sheer, 29 ft.; depth from lower deck beams to top of floors, 10 ft.

The stern frame forging is in one piece, the head of post being firmly connected to main deck beams, the section between shaft boss and keel being 10 in. by 5 in. and the section over propeller arch 10 in. by 4¾ in. The rudder is of one forging, about 5½ ft. wide. The steel frames of the hull are spaced 24 in. centers. They are 5x3x8-16 in. in thickness for about three-fifths mid-length of the vessel, the balance reduced to 7-16 in. in thickness. They are all in one length from center of keel to spar deck stringers. At all bulkheads, under engines, and at belts, they are doubled according to the classification association requirements. Double frames are carried to or between deck stringers each side of all side ports. The reverse frames are 3x3x7-16 in., extending alternately to top of lower deck, water-way angle iron tops and the spar deck beam knees, and pass over all the beam knees of lower and main decks at forward and after ends of

**Tug Wilmington.**

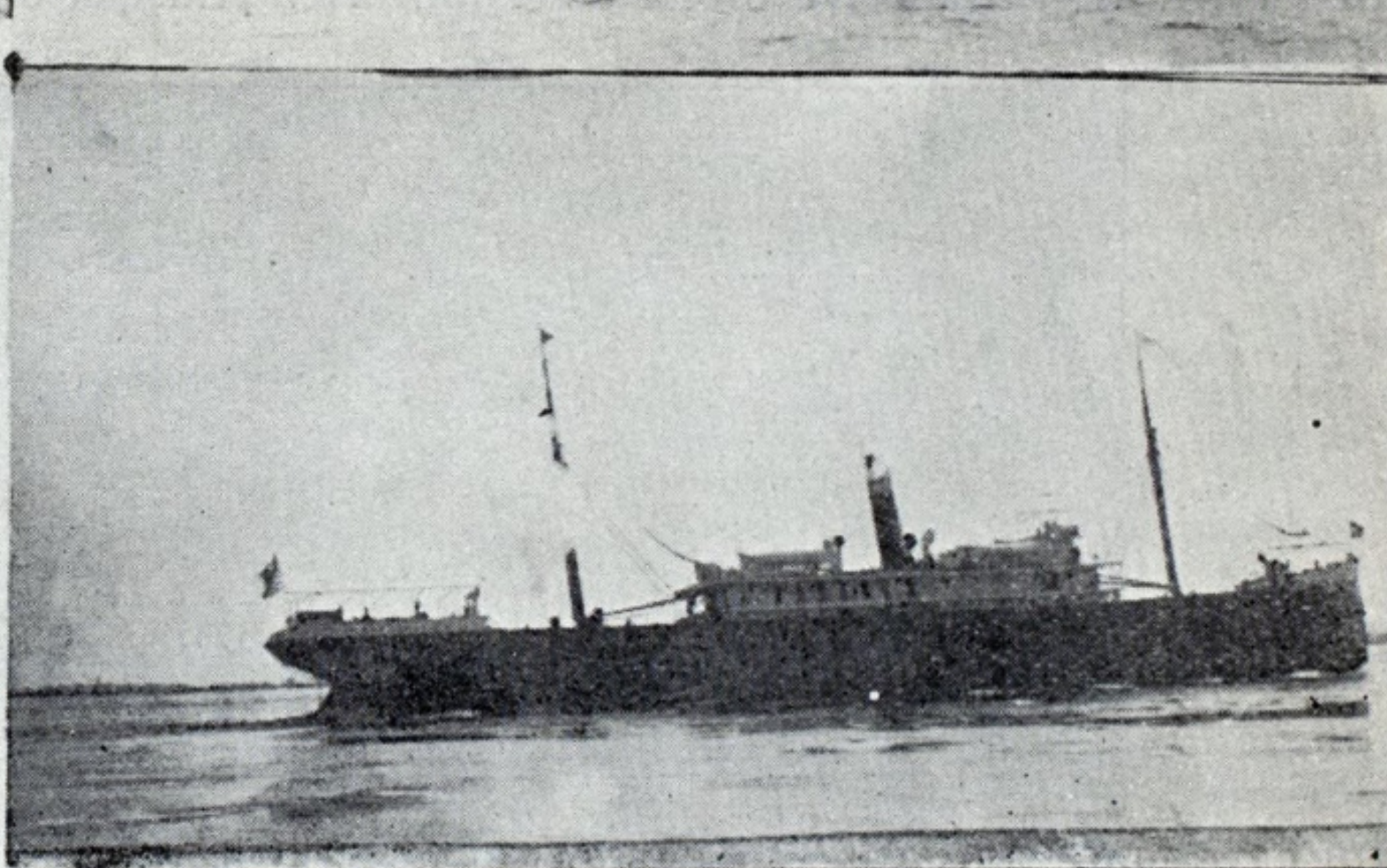
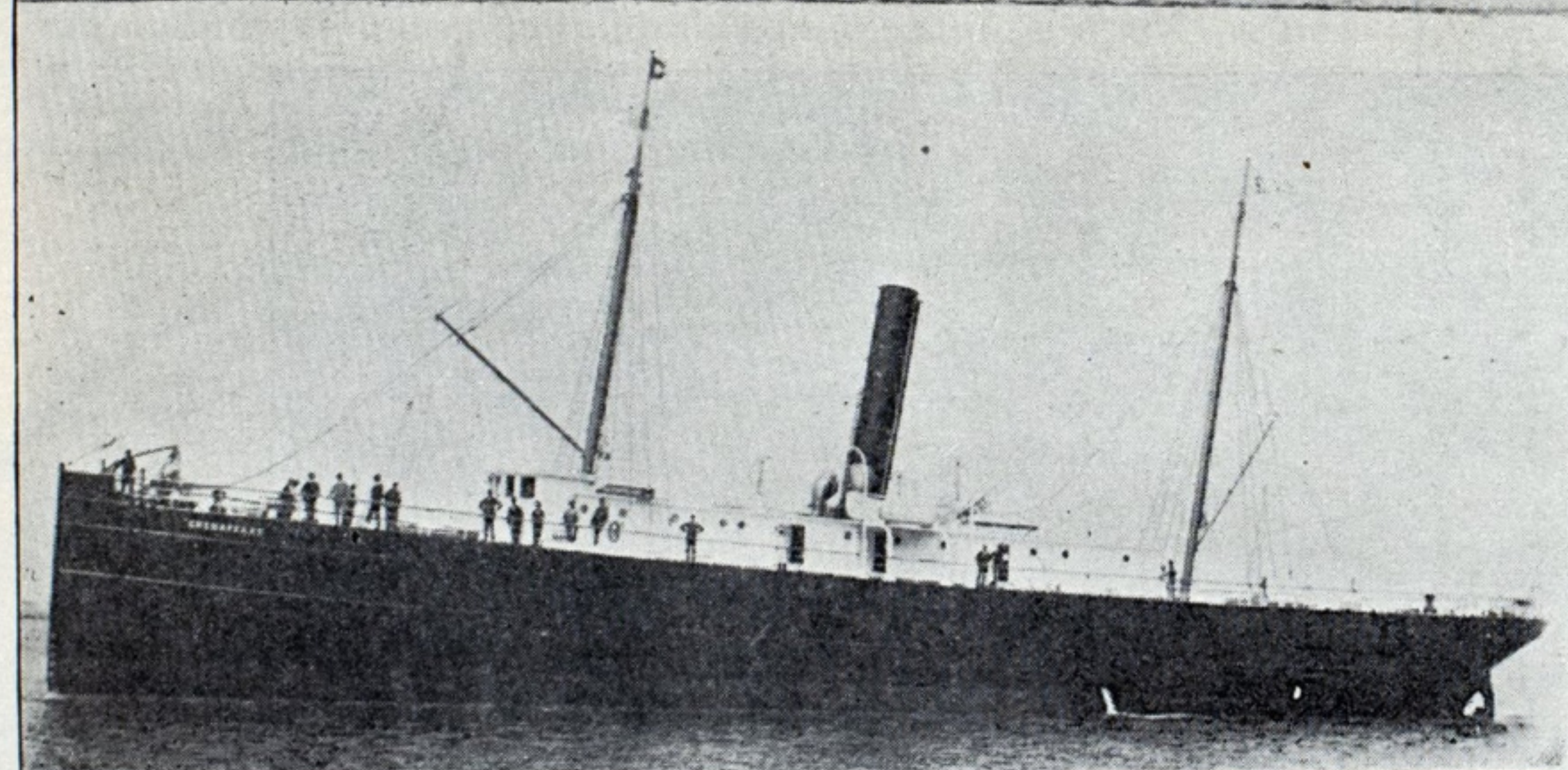
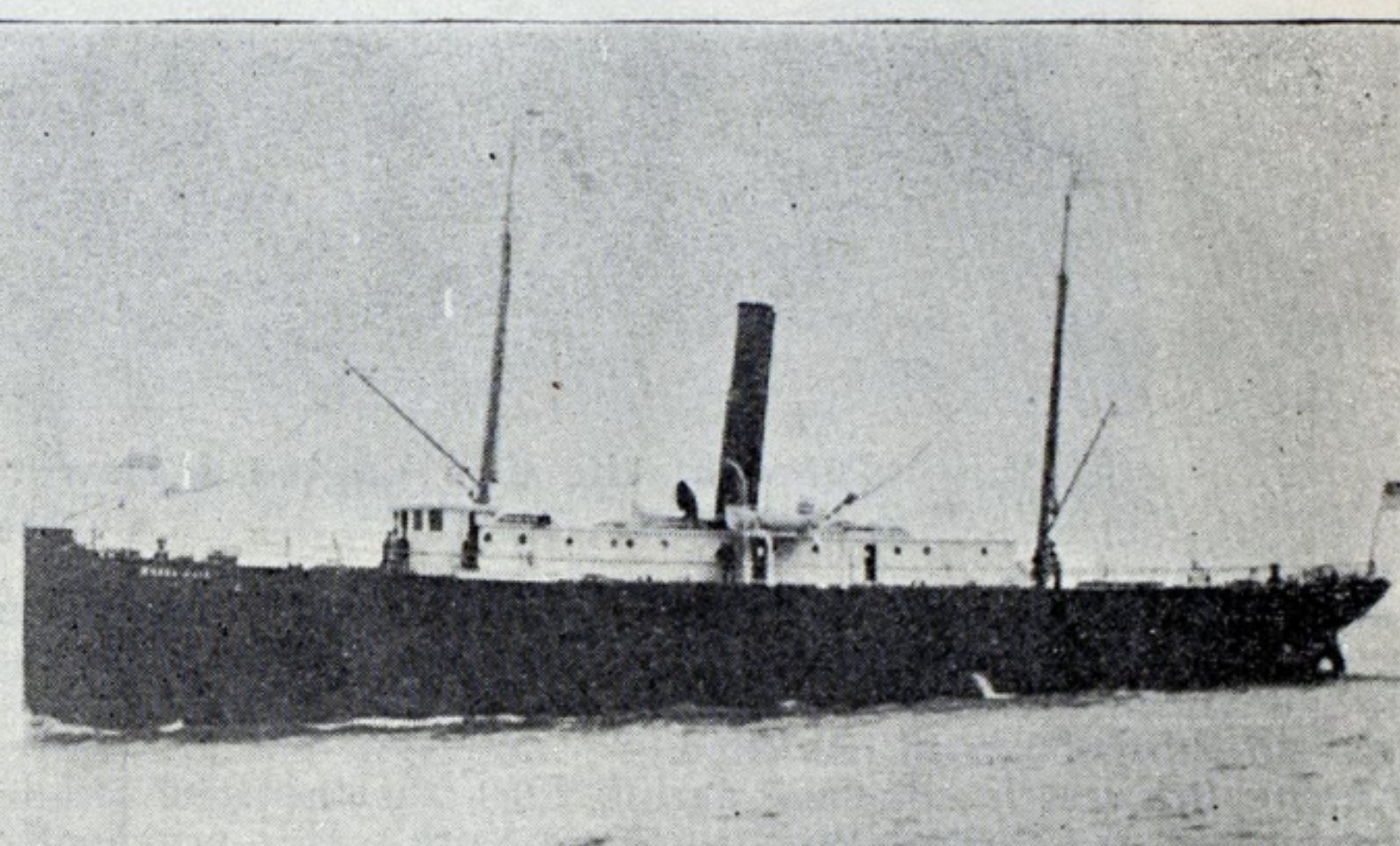
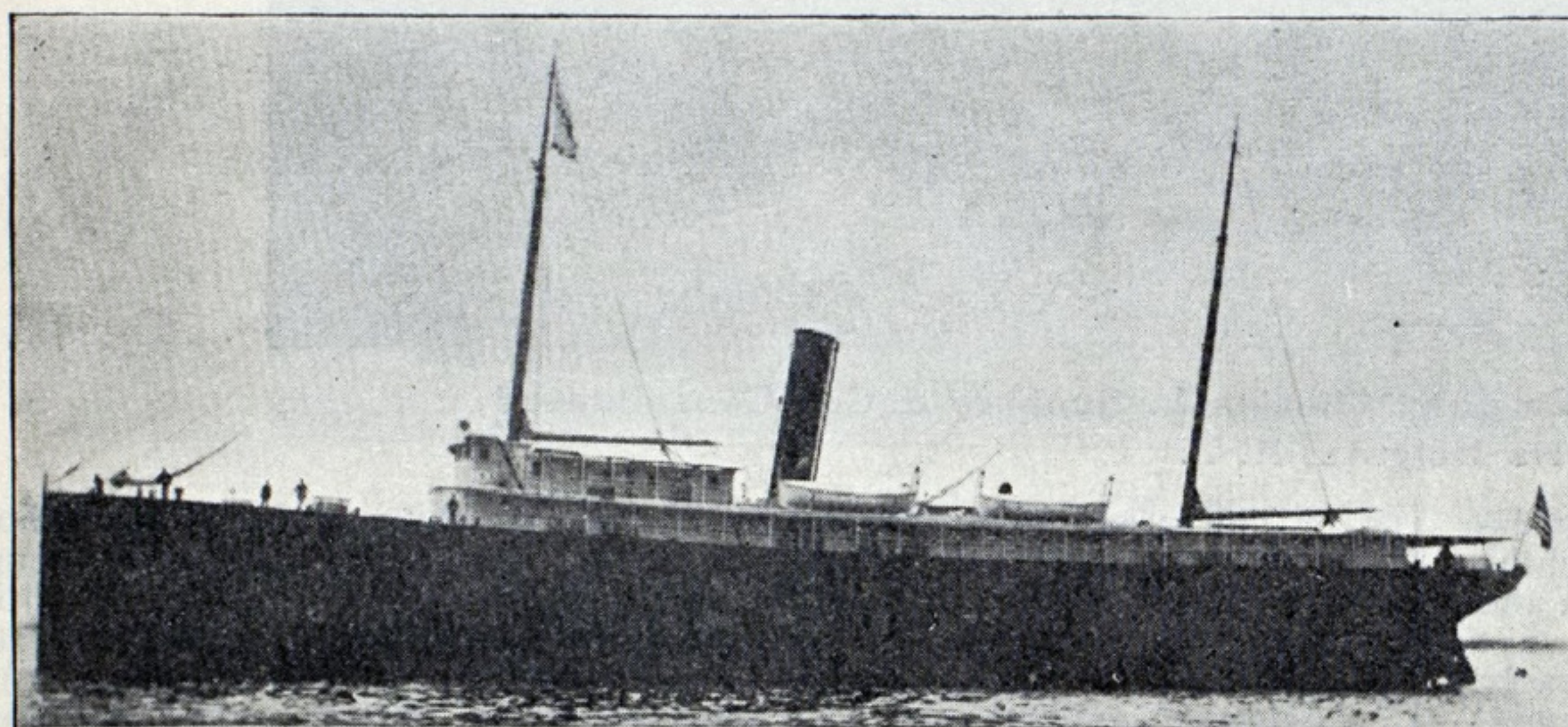
Built by the Harlan & Hollingsworth Co., Wilmington, Del.

ship. Where there are intermediate side stringers below main deck there is a short, double reverse frame extending up to the tops of such intermediate stringers. Throughout the engine space these frames are double to the top of upper bilge stringers, and also double to fore end of boiler space to the half turn of bilge. They are also doubled in the cargo space to outside of half floor keelson for one-third the length of the fore-and-aft holds, the balance to ends diminishing in length to meet requirements. There are also double reverse bars on the line of all keelsons and stringers, and likewise to all belts or frames where required. No butts are nearer

plates, all connected to sides plating over bunkers, and water ballast, and for the length of machinery and boiler space plated with 6-16 in. iron butts doubled chain riveted; edges lapped and single riveted; butts of stringers treble-chain riveted half mid-length and balance double; forward and aft of deck plating taper connection being made to the stringer plates.

The stringers between the main and lower decks are of double angles, 4x4x½ in., with plate 3-8 in. thick connecting to side plating by angles 3x3x½ in. terminating on a V plate at stem. The main deck stringers are scant 9-16 in. thick by 43 in. wide for half the mid-length of the vessel, and then by gradual reduction taper to 30 in. by 8-16 in. at ends, connected through to side plating. The butts for three-fifths the mid-length are treble-chain riveted; balance double-chain riveted; waterway angles 4x3x9-16 in. continuing entirely around the butts, well shifted, caulked water-tight and cemented, making a slope from outside plating 4x3x9-16 in.; angles forming waste basins where the hoisting and steering engines are located.

The deck plating is 6-16 in. in thickness, increased abreast of the machinery hatch, under the windlass and small engines, and decreased in thickness forward and aft of location of engine and boilers. These plates are capped longitudinally throughout, being single-riveted. The butts are of loose joints, double-chain riveted. The passage openings through the spar and main decks are 24 in. in diameter, being made of angle rings in order to give access to the forward and after lower between-deck ports. The spar deck stringers are 43 in. wide for half of the mid-length of vessel, 9-16 in. thick abreast of large side ports, and extend 4 ft. each way of same in one sheet, and between these are 7-16 in. thick. They diminish to 30x6-16 in. at ends of slip. The deck ties continue fore and aft along the machinery and other hatches, 7-16x24 in. The main ties are treble-chain riveted throughout, the space of the donkey boiler and pumps being ¼-in. iron deck. The bottom and bilge plating to top turn of bilge is 21-32 in. thick for half mid-length of vessel, then reduced by regularly diminishing as per rule to ends of vessel, exception being made in the

The Grecian.**The Mannahata.****The Chesapeake.****The San Juan.**

Built by the Harlan & Hollingsworth Co., Wilmington, Del.

than 5 ft. The floors are of 10-16x24 in. for half of the mid-length of the vessel, the balance at ends reduced to 8-16 in. Under engines they are of increased depth. Butts are all double strapped and treble riveted.

The intercostal plates of the center keelson are 9-16 in. thick for two-thirds of the center of the vessel, the balance at each end being reduced to 8-16 in., and at bow, where increased in depth, are 7-16 in. thick. The intercostal plates in engine and boiler space are 10-16 in. thick. The rider plates are 12x11-16 in. for two-thirds the length, then reduced to 10-16 in. at fore end and to 9-16 in. thick. Angle bars are riveted in staggered line, the butts well fished. The half-floor keelsons are intercostals, 1-16 in. less in thickness than the floors to which they connect. They are secured by 3x3x8-16 in. angles to floors and outside plating, and jogged over the reverse frames. The lower bilge keelsons are angles 5x3½x10-16 in. in long lengths. The upper bilge keelson are 8x½ in. bulb angles and 4x½ in. angles, the butts being shifted 10 ft. apart. The hold and intermediate stringers are of 4x4x½ in., doubled at ice line at bow and having intercostal pieces terminating on a V plate, all connecting to skin. Beams of main and lower deck are of bulb and T, 10x10-16 in. at all hatches, and 10x9-16 in. for the balance. The beams of the spar deck are of bulb and T 7½x8-16 in. at hatches and 6-16 in. thick for balance. The lower deck stringers are 33 in. wide by a scant 9-16 in. thick for half mid-length and reduced to 8-16x25 in. at ends. These connect with V

boss plates, which are 21-32 in. The inside strakes for half mid-length are 23-32x30 in., reduced to 21-32 in. at ends. The sheer strake is 34 in. wide by 12-16 in. thick, reduced by regular diminish from half mid-length to 9-16 in. aft and 10-16 in. forward, the butts being treble-chain riveted to beyond the two large side ports; double-riveted lower seam and single to top side plating on butts. The pole masts are of steel, about 128 ft. above the step or lower deck. The main deck is of seasoned yellow pine, sheathed with spruce. There are an unusual number of freight cranes, and the facilities for getting cargo in and out are fully up to the best practice.

The Whitney has a triple expansion engine of surface-condensing, direct-acting type. The high pressure cylinder 29 in. diameter, intermediate 46 in. and low pressure 75 in., with 48 in. stroke of piston. There is a full set of Blake pumps throughout the ship, the air pump being independent. The propeller wheel is 16 ft. in diameter by 21½ mean pitch, the hub being of cast steel and the blades of manganese bronze. There are four main boilers of steel, with cylindrical shells, and three Morrison corrugated furnaces in each. They are each 13 ft. long by 14 ft. in diameter. The ship is lighted throughout by electricity, the engine being of the Forbes type, with a Croker-Wheeler dynamo. Other features of equipment are a steam steerer and two stockless anchors, one weighing 4,000 lbs. and the other 3,500 lbs. There is also a 750-lb. kedge anchor.

Yacht Construction During 1900.



AMONG the leading builders of yachts and pleasure craft of all kinds in the United States is the Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y. Anyone interested in steam yachts and naphtha launches visiting New York would do well to inspect the plant at Morris Heights. It can be reached from the Grand Central station at Forty-second street in seventeen minutes, and trains run twenty times a day. The production of this company probably covers a wider field than

smoking and music room, stairs from this compartment leading to the main saloon below. The officers' staterooms, crews' quarters, mess room, galley, chain and locker are all arranged forward of machinery. The machinery consists of two Seabury triple expansion, marine engines, and a Seabury safety water tube boiler of latest design. The yacht is equipped with electric light plant, storage batteries, search light, steam heaters, steam windlass, naphtha launch, sailing gig, and, indeed, all modern appliances.

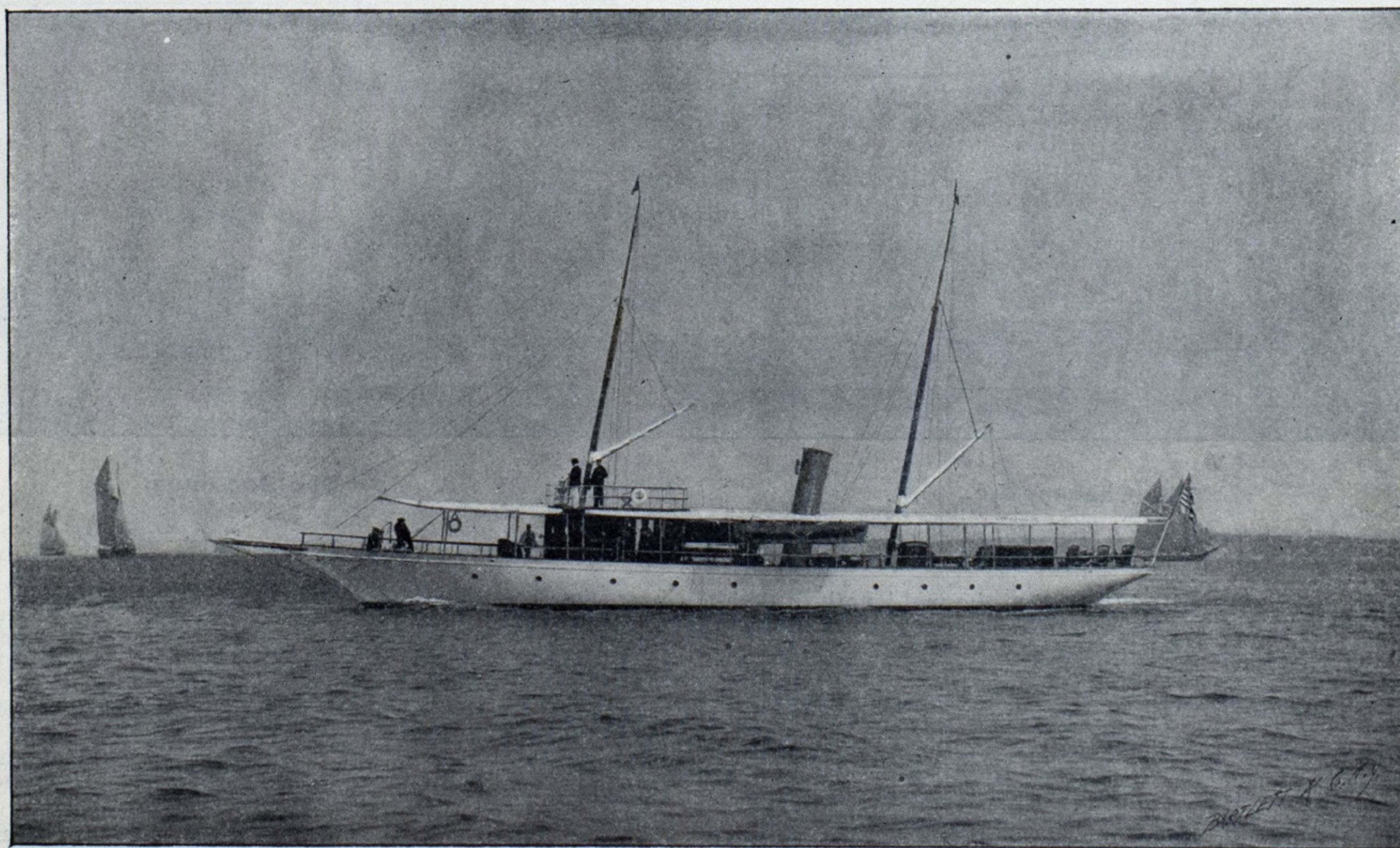


Plant of the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

that of any other ship building concern in the world. The company designs, builds, equips and furnishes steam yachts and launches, naphtha yachts and launches, electric boats, sail craft, torpedo boats, tug boats and lighters—in short, boats of any kind.

Among the vessels launched during 1900 was the steel steam yacht Elfrida for Dr. W. Seward Webb of New York. Her principal dimen-

The steam yacht Washita for Mr. H. W. Putnam, Jr., of New York, is also a comparatively recent product. Her dimensions are: Length over all, 103 ft.; length on water line, 83 ft.; beam, 14 ft.; depth, 8 ft. 3 in.; draught, 5 ft. She is built of white oak and has four water tight steel bulkheads, one a collision bulkhead forward, one forward and one aft of machinery compartment, and one forward of lazarette. The machinery



Steam Yacht Washita.

Built by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

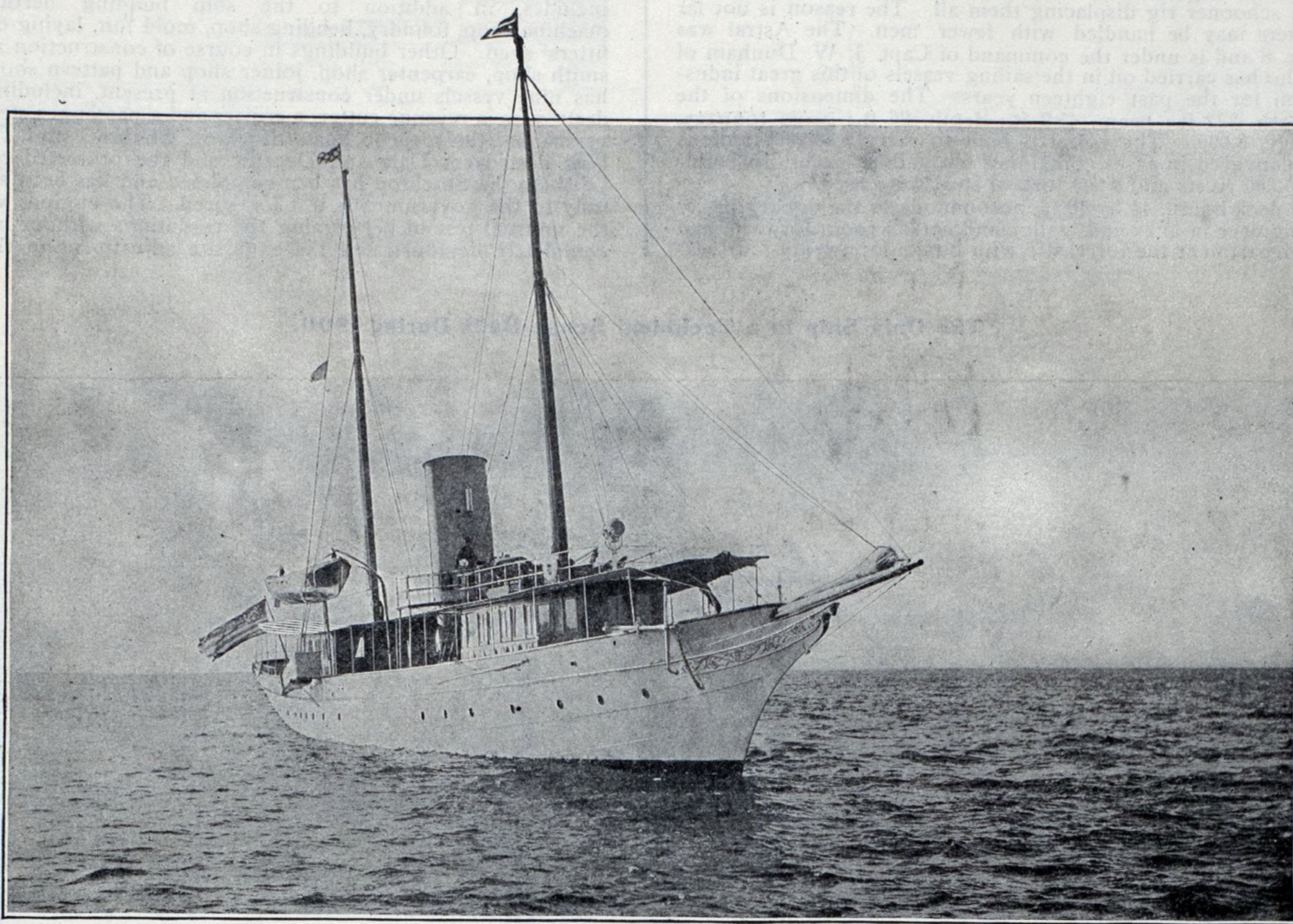
sions are 141 ft. over all, 113 ft. on the water line, 18 ft. beam and 7 ft. 6 in. draught. She is a twin-screw vessel constructed entirely of steel, flush deck, schooner rigged with two pole masts, no gaffs carried. She will be used by Dr. Webb at his country home on Lake Champlain. The yacht is elegantly fitted throughout and is finished in the finest of hard woods. On the deck forward is the dining saloon with butler's pantry and buffet. There is also an after deck or social hall, which is used as

consists of a Seabury triple expansion engine, with cylinders of 7, 11¼ and 17½ in. diameter by 10 in. stroke, and Seabury water tube boiler. The yacht is steam-heated and lighted by electricity, supplied by direct connected dynamo and storage batteries. The staterooms are finished in bird's eye maple.

The company built during the year a launch for Harvard college. The launch was 51 ft. in length, 7 ft. 9 in. beam, 4 ft. deep, and about 3

ft. draught. The draught of hull is 24 in. The framing is of white oak, teak plank shear, double planking of cedar with broken seams; white pine decks and white ash cockpits; steel bulkheads fore and aft of machinery. The launch is equipped with a Seabury water tube boiler and Seabury triple expansion engine, cylinders $4\frac{1}{4}$, $6\frac{3}{4}$ and $10\frac{1}{2}$ in., with a stroke of 8 in. She attained a speed of about 18 miles an hour and has been found

The Morris Heights company also has on the stocks now a twin-screw steam yacht for Leonard Lewisohn of New York. The hull will be of steel throughout and will be of the following dimensions: Length over all, 155 ft.; length on water line, 130 ft.; beam, 18 ft.; depth, 10 ft.; draught, 7 ft. 6 in. She will have a flush deck and will be schooner rigged with pole masts. There will be a mahogany deck house forward, which



Steam Yacht Elfrida, for Dr. Seward Webb of New York.

Built by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

most satisfactory for the purpose designed, namely coaching the rowing crews of the college.

A twin-screw naphtha launch was also one of the outputs of the year. The hull was of oak frame, cedar planking and yellow keel and keelson. The interior was in mahogany finish. The launch is equipped with two 12 H.P. naphtha motors, complete with tanks, feed and condenser pipes, pumps, propeller wheels, shafts and stern bearings.

will be used as a dining saloon. This will be paneled and fitted with plate glass sliding windows. There will be a buffet and butler's pantry adjoining. Below deck, starting at the bow, will be the chain locker, followed by a boatswain's locker and the crew quarters. The officers' staterooms come next, and then the galley, which is the full width of the ship. Next aft will be the boiler and engine spaces. Aft of the machinery space will be a large bath room, the full width of the yacht, and connecting with this bath room will be two large state rooms, each fitted with a double brass bedstead, dressing table, upholstered divan and a full length beveled mirror. These rooms will be finished in white mahogany and lighted and ventilated by ports and skylights. Aft of these rooms, which will be for the owner, will be two more staterooms with a passageway between them. Bath rooms connect between them. Next aft will be the main saloons, finished in white and gold. The motive power will consist of two triple expansion engines, driving twin screws. Steam will be supplied by a Seabury safety water tube boiler. There will be an electric light plant, a 2,500 candle-power search light, steam steering gear and steam windlass, and the vessel will be steam heated throughout. The yacht is designed for a speed of 18 miles an hour and is to be ready by May 1.

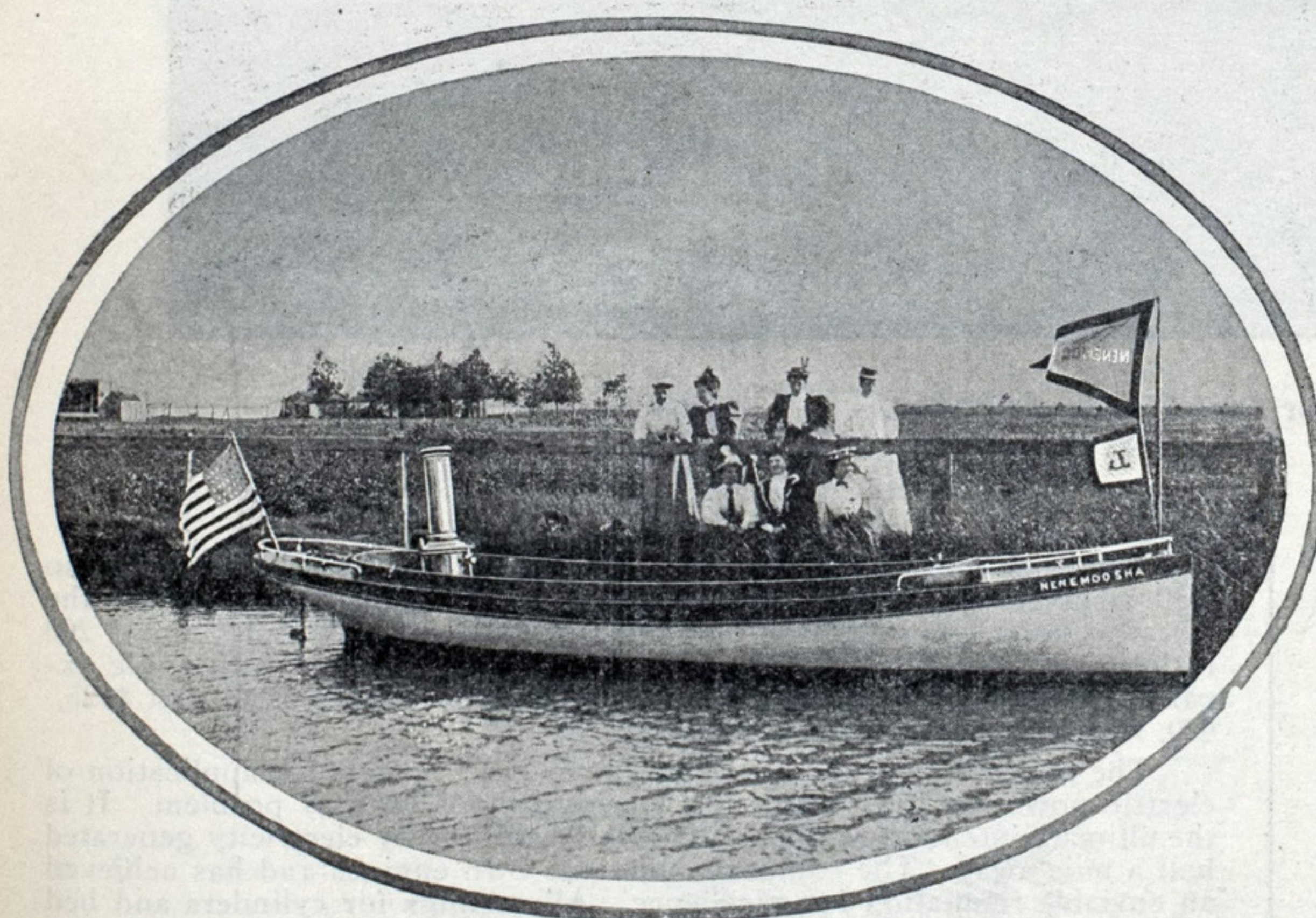
The company is also building for a Boston yachtsman, from designs by Arthur Binney, a yacht 86 ft. over all, 78 ft. on the water line, and 12 ft. beam. The machinery will consist of a Seabury triple expansion engine with cylinders 7, $11\frac{1}{4}$ and $17\frac{1}{2}$ in. diameter by 10 in. stroke, and a water tube boiler designed for a speed of 12 knots.

The new steam yacht Cherokee is fast approaching completion at these works. The vessel is of steel, 85 ft. long, 14 ft. beam, and is for Samuel H. Vandergrift of Pittsburg, Pa. A complete list of vessels under way will be found in the resume devoted to ship building.

Petersburg Iron Works Co.

The Petersburg Iron Works Co. of Petersburg, Va., during the past year, in addition to greatly enlarging the long established business of its shops and foundry, has entered the field of marine work and added a ship yard to its plant, which is already in successful operation and promises steady enlargement for the future. The company built last year two 800-yard dump scows for ship channel work on Chesapeake bay, and now has under construction one of the new light-ships for the government, which will be completed the present year. They have also been lately awarded by the government a contract for a seagoing, self-propelling, suction dredge complete, which will be 200 ft. in length and 40 ft. beam. The company will for the present restrict its work to wooden vessels.

Among the navy orders of the past week is one of special interest in shipping circles. It is the announcement that Capt. W. Maynard is to be detached from duty as member of the examining board in the Washington yard and ordered to duty with the United States light-house board as naval secretary upon the detachment of Capt. Perry. Capt. Perry will probably go to sea.



25-ft. Naphtha Launch at Detroit.

Built by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. C.

With the exception of the raw material the company makes everything that goes into its boats. It makes the hulls, machinery, fittings and upholstery. The plant covers a territory of nine acres and gives employment to 600 to 950 men, depending upon the amount of work at hand. The company is now building three torpedo boats for the navy, Bailey, Wilkes and Stewart, the latter coming under the destroyer class. The Bailey is completed and on a recent trial over the government knot course at Newport, R. I., under calculations of the government trial board, made the knot at the rate of 30.88 knots per hour, the highest speed ever attained by an American craft.

Sailing Ship Astral.

The Astral, a steel vessel built by Arthur Sewall & Co., Bath, Me., for the Standard Oil Co., has the distinction of being the only ship in a technical sense constructed in the United States during the year 1900, for a ship is not technically a ship unless she is full rigged. With the bark and the brig and the brigantine the ship is gradually going out of existence, the simple schooner rig displacing them all. The reason is not far to seek—schooners may be handled with fewer men. The Astral was launched on Dec. 8 and is under the command of Capt. J. W. Dunham of Salem, Mass., who has carried oil in the sailing vessels of this great industrial organization for the past eighteen years. The dimensions of the Astral are. Length, 332 ft.; beam, 45.3 ft.; depth, 26 ft.; gross tonnage, 3,206; net tonnage, 3,000. The vessel is built to carry 1,500,000 gallons of oil, which is conveyed in cases containing ten gallons each. In building this ship, 325,000 rivets and 2,000 tons of steel were used.

The forward deck house, 44 by 18 ft., accommodates the donkey boiler with berth for engineer in after end, galley and cook's room forward, and forward of this department the forecabin with bunks for twenty-four sea-

William R. Trigg Co., Richmond, Va.

Yielding to the necessity for facilities for handling its rapidly increasing business, the William R. Trigg Co. has made more improvements within the past year in the Richmond works that has so rapidly attained a prominent place among the ship building establishments of the country. This company's plant now includes, in addition to the ship building berths and slips, a machine shop, foundry, bending shop, mold loft, laying off shed and ship-fitters' shed. Other buildings in course of construction are a boiler shop, smith shop, carpenter shop, joiner shop and pattern shop. The company has nine vessels under construction at present, including torpedo boats, destroyers, a revenue cutter, a cruiser and a passenger steamer. The naval vessels are the torpedo boats Stockton, Shubrick and Thornton, torpedo boat destroyers Dale and Decatur and the protected cruiser Galveston. Of these the Stockton has been completed and has been subjected successfully to the government's test for speed. The engines were subjected to the unusual test of performing the evolutions without lubrication, which completely demonstrated the exquisite adjustment of the moving parts.

The Only Ship in a Technical Sense Built During 1900.



The Ship Astral, for the Standard Oil Co.

Built by Arthur Sewall & Co., Bath, Me.

men. In the midship house is the messroom and four staterooms for petty officers and the carpenter's shop and sail room in after end. The poop deck extends 44 ft. in length, covering the commodious cabin finished in white and gold with hard wood floors. The house is excellently lighted. On the starboard side is the captain's office and living quarters fitted up with convenient lockers, desk and a brass bedstead and private bath adjoining. In the center of the house is the main after cabin, with dining room and steward's pantry forward. On the port side are rooms for the first and second officers, three spare rooms for guests and a lavatory. A stairway on the starboard side leads to a chart house on the deck above. The apartment is fitted with a bed lounge, desk and chronometer stand. The furniture of the cabin and chart house is of oak and plush and rugs are used on the floors, leaving a margin on the polished hard-wood surface. Way aft is a steel wheel house 12 by 15 ft.

The steel masts of the Astral are 35 ft. long and fitted with double top-gallant yards, all of steel. The lower yards are 96 ft. and the royals 55 ft. in length. There are two full decks, between decks, and the poop and forecabin decks. There is one 7-in. pump to work the donkey boiler. The anchors include two iron stock bower anchors weighing 6,500 lbs., one stream anchor of 600 lbs., one kedge of 800 lbs., and 210 fathoms of 2 3-16 steel link B. B. chain cables. The Astral will carry a complement of thirty-five men and will sail with oil to Shanghai, China, returning with hemp and sugar.

The Acme, a sister ship to the Astral, is also on the stocks at Arthur Sewall & Co.'s ship yard, Bath, Me., and will be launched during the coming spring.

The Shubrick will be launched in a few weeks, but the others are not so well advanced. The passenger steamer under construction is for the Chesapeake & Ohio Railway Co., and is promised for Nov. 1. She is 200 ft. long, to be of 675 tons displacement, is to be equipped with triple expansion engine and twin screws, two Thornycroft boilers, is to cost \$125,000, and will be christened Virginia.

The proximity of the falls of the James river renders the application of electric power for this company's machine shops an easy problem. It is the ultimate intention to operate all the machinery by electricity generated half a mile away. The company builds its own engines and has achieved an enviable reputation for excellence. All castings for cylinders and bed plates are made in its own foundries. The company was organized Oct. 1, 1898, and in a short period of its existence its growth has been phenomenal. The improvements begun during the past year will cost approximately \$600,000. The officers of the company are: William R. Trigg, president; Linburn T. Myers, vice-president; James A. Nelson, superintendent. The number of employees is now about 900, but it will be necessary to increase this number considerably in the near future. The total area of land is twenty-six acres, with a total water frontage available for ship building purposes of 1.72 miles of adequate depth. The tools now in process of installation represent the best product of tool builders. Ample arrangements have been made for comfortably and cheaply housing the workmen. In fact no ship building firm can view the future with greater satisfaction or greater expectation. Owing to the climate, work can be pursued in the open air all the year round.

Newport News Ship Building & Dry Dock Co.

NO ship yard in the country has as much tonnage under construction as the Newport News Ship Building & Dry Dock Co., Newport News, Va. This is the only ship yard to receive four contracts in the recent apportionment of government vessels—one battleship, two armored cruisers and one protected cruiser.

The thirteen vessels now under construction at the yards, or for which contracts have been received, aggregate in displacement 140,000 tons and cost about \$27,000,000. There are at present 6,500 men employed at the yards and the new contracts for warships will entail the necessity for the employment of 1,500 more. During the past year the Cromwell line steamships *Comus* and *Proteus* have been turned over to their owners, the last of the four steamships on the second order for the Morgan line went into service and the speedy battleships *Kearsarge* and *Kentucky* were accepted by the United States government. The first ships built at this yard for the Morgan line were turned out in the early 90's. During the Spanish war these ships were secured by the government as auxiliary cruisers and the Morgan line placed its second order for four more large steamships. These are now in service, bearing the names of the old vessels, *El Norte*, *El Rio*, *El Sud* and *El Cid*. Today the yard has contracts for four more ships for the same line and three of them are now on the ways.

During the year material progress has been made on the battleships *Illinois* and *Missouri* and the monitor *Arkansas*. Keels were laid for the two large Pacific Mail steamers, *Siberia* and *Korea*, which are described in detail later in this article, and keels were also laid for three Morgan liners, *El Alba*, *El Dia* and *El Libre*. The keel of the fourth, *El Siglo*, will go down very shortly. These vessels are each 406 ft. long over all. The monitor *Arkansas* was launched last November. The battleship *Illinois* is nearly ready for her trial trip. The battleship *Missouri* is on the ways and is about 20 per cent. completed. All of the merchant ships now on the stocks will be launched during the early months of the present year.

IMPROVEMENTS AT PLANT.

Concerning improvements at the works of the Newport News company during the past twelve months, the new dry dock, now nearing completion, is the most distinguishing. Its dimensions are as follows:

Length from end of apron to forward coping, 860½ ft.; width at top, 162 ft.; width at bottom, 80 ft.; depth of water over sill, 30 ft.; depth from floor to top of coping, 41½ ft.; slope of alters, 45°.

The main body of the dock is constructed of wood, with masonry entrance, and, as will be seen from the dimensions, is sufficiently large to dock, at one time, two of the largest of modern battleships and will, of course, dock any one vessel now afloat and liable to be constructed for a number of years to come. The cost of this immense basin is placed at \$1,000,000. At times as high as 1,000 men have been employed upon it. The caisson is of steel and will be operated with trimming tanks. The pumping plant will empty the dock in two hours, which is at the rate of 200,000 gallons a minute. The old dry dock is of the following dimensions: Length on top, 610 ft.; width on top, 130 ft.; width on bottom, 50 ft.; width at entrance, 93 ft.; draught of water over sill, 25 ft.; time required to pump the water out of dock, 1 hour and 30 minutes.

Much important repair work has been done at the yards of late. The transport *Buford* was converted into a troop ship at a cost of \$400,000, and the North German Lloyd steamship *Main* is being rebuilt at a cost of \$600,000. The *Main* was burned in the recent Hoboken fire and presented a complete wreck inside.

The power plant in the yard, which has been undergoing development during the year, is in its present condition an extension of the old power plant, involving re-arrangement, re-construction and large additions to the plant. Following is a general description of improvements: Electric power is now utilized for driving a very large number of the machine tools throughout the plant, the tools being driven in some cases by individual motors, and in other cases from line shafting, which in turn is driven by electric motor. Electric power is also to be utilized for operating the large pumps now being installed for pumping the new dry dock, and which are also to serve for pumping out the old dock. The electric plant, for furnishing the necessary power, includes three 600 K. W. General Electric twelve-pole, 250-volt dynamos, each direct connected to a McIntosh & Seymour vertical compound condensing engine, with cylinders 22 and 44 in. in diameter and 36 in. stroke, running at 120 revolutions per minute; three 125 K. W. Crocker-Wheeler eight-pole, 125-volt dynamos, both driven by a Ball & Wood horizontal tandem compound condensing engine, with cylinders 15½ in. and 31 in. diameter and 18 in. stroke, running at 250 revolutions per minute. These, together with four other generators of smaller size, give an electric output of about 2,270 K. W., connections for which are made through one main switch-board 40 ft.

long, with fittings and accessories of the most modern and improved types.

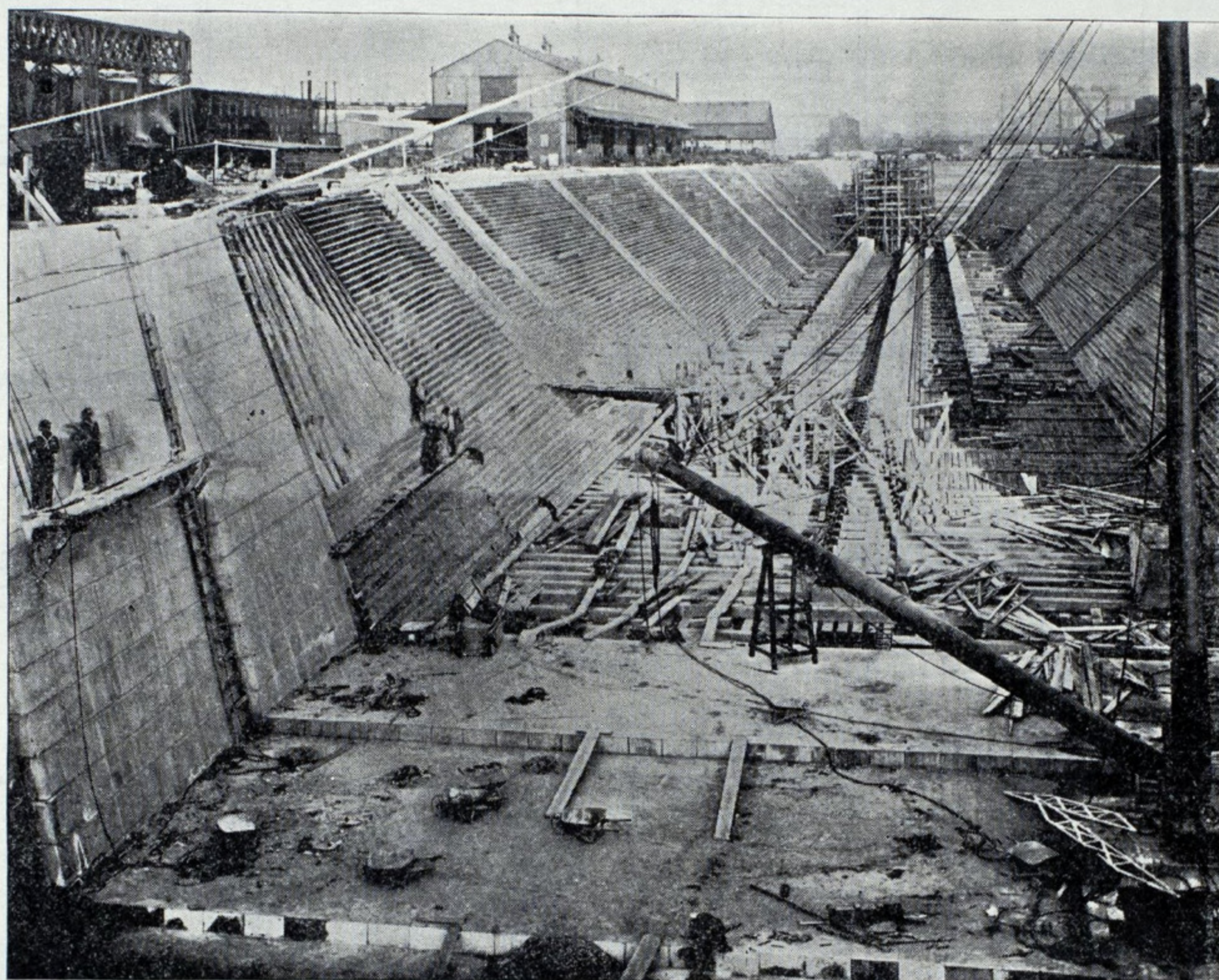
In addition to the electric generating plant, there are three air compressors, capable of compressing a total of about 6,000 cu. ft. of free air per minute to a pressure of about 100 lbs. per sq. in., which is utilized in operating the large number of air tools in use in the various departments throughout the yard. An hydraulic plant of large capacity is also maintained for furnishing power for the several large hydraulic tools in operation throughout the yard. Steam for the entire power plant is supplied by eight marine-type Scotch boilers, working at a pressure of 120 lbs. per square inch.

THE PACIFIC MAIL LINERS.

The steamships *Siberia* and *Korea*, building for the Pacific Mail Co., will be launched in a few weeks and are intended for service between San Francisco and Hong Kong, with Honolulu, Yokohama and Nagasaki as ports of call. They will be capable of making 18 knots in regular service, and will be in nearly all respects the equal of the best ships afloat. Following are the dimensions of the vessels: Length between perpendiculars, 550 ft.; length over all, 572 ft. 4 in.; beam, 63 ft.; depth, 40 ft.; draught, 27 ft.; displacement, about 18,600 tons. Accommodations will be provided for 200 first-class passengers, thirty white steerage and 1,200 Chinese. Quarters for the latter are arranged so that the space may be utilized for other purposes if unoccupied by Chinese. The hulls will be constructed of steel with frames spaced 32 in. apart throughout. A double bottom

extends from stem to stern and is carried up to the turn in the bilge. There are four decks extending the whole length of the vessels, known as the lower, main, upper and promenade decks. In addition to these are the orlop and boat decks.

Machinery of vessels of this kind is, of course, of much interest. The main engines consist of two four-cylinder, quadruple expansion engines of the vertical, inverted, direct-acting type, placed abreast of each other in separate water tight compartments. The cylinders are of following dimensions: High pressure, 35 in.; first intermediate pressure, 50 in.; second intermediate pressure, 70 in.; and low pressure, 100 in. diameter, with a common stroke of 66 in. The engines are designed to develop 18,000 I.H.P. while running at eighty-six revolutions per minute. The cylinders are arranged in the following order: High pressure forward, low pressure, second intermediate pressure and first intermediate pressure aft. The engine framing consists of cast steel columns of I section, secured to the cylinders and



Present Condition of Newport News Co.'s New Dry Dock.

bed plates. The bed plates are also of cast steel. The valves are of the single-ported piston type and are of cast iron. The link motion is the Stephen's link type. All the cylinders are steam jacketed. The piston rods are of forged steel, fitted with cast iron cross head slippers lined with Parsons' white bronze, which work in cast iron cross-head guides. The connecting rods are of forged steel, 138 in. long between center of crank and center of cross-head pin. The pistons are of cast steel and are of the dished pattern. The eccentrics are of cast iron, keyed to the crank shafts. The eccentric rods and valve stems are of forged steel, the former being secured to the eccentrics by composition straps. Each main engine will be fitted with a steam and hydraulic direct-acting reversing engine and a 7 in. by 5 in. turning engine. The thrust bearings will be two in number, of the ordinary horseshoe type, with fourteen shoes to each bearing. The stern tube bearings will be of the ordinary brass sleeve pattern, fitted with lignum vitae. The crank shafts will be forged steel in four interchangeable sections. The thrust, line and propeller shafts will also be forged steel. All shafts will be hollow. From the stern tube stuffing box to the propeller hub the propeller shafts will have sleeves of composition for protection against the corrosive action of the sea water. The propellers will be of the three-blade type, the hubs being cast steel and the blades bronze. There will be two main condensers, one for each main engine. Each main condenser will have an independent air pump and two circulating pumps, the circulating pumps to be operated by a compound engine. Two auxiliary condensers will also be provided, with combined air and circulating pumps attached. Two feed water heaters will also be installed.

The boilers are to be nine in number, eight main boilers and one donkey boiler of the horizontal, return, fire-tube type. The arrangement of boilers is as follows: One donkey boiler on the upper deck in the boiler hatch; main boilers placed in a fore-and-aft direction in two compartments; with all fire rooms athwartship; in the after boiler compartment two single-ended and three double-ended boilers and in the forward boiler compartment three double-ended boilers. All these boilers are of Scotch type, and the steam pressure is 200 lbs. in donkey boiler as well as in the main boilers. The diameter of single-ended and double-ended boilers is also the same, 16 ft. The two single-ended boilers will have four furnaces, with 76.58 sq. ft. of grate surface and 3,208 sq. ft. of heating sur-

face. The six double-ended boilers will have eight furnaces with 153.16 ft. of grate surface and 6,416 sq. ft. of heating surface.

EXTRACTS FROM SPECIFICATIONS.

The following notations regarding frames, plating, etc., taken from the drawings, will prove interesting:

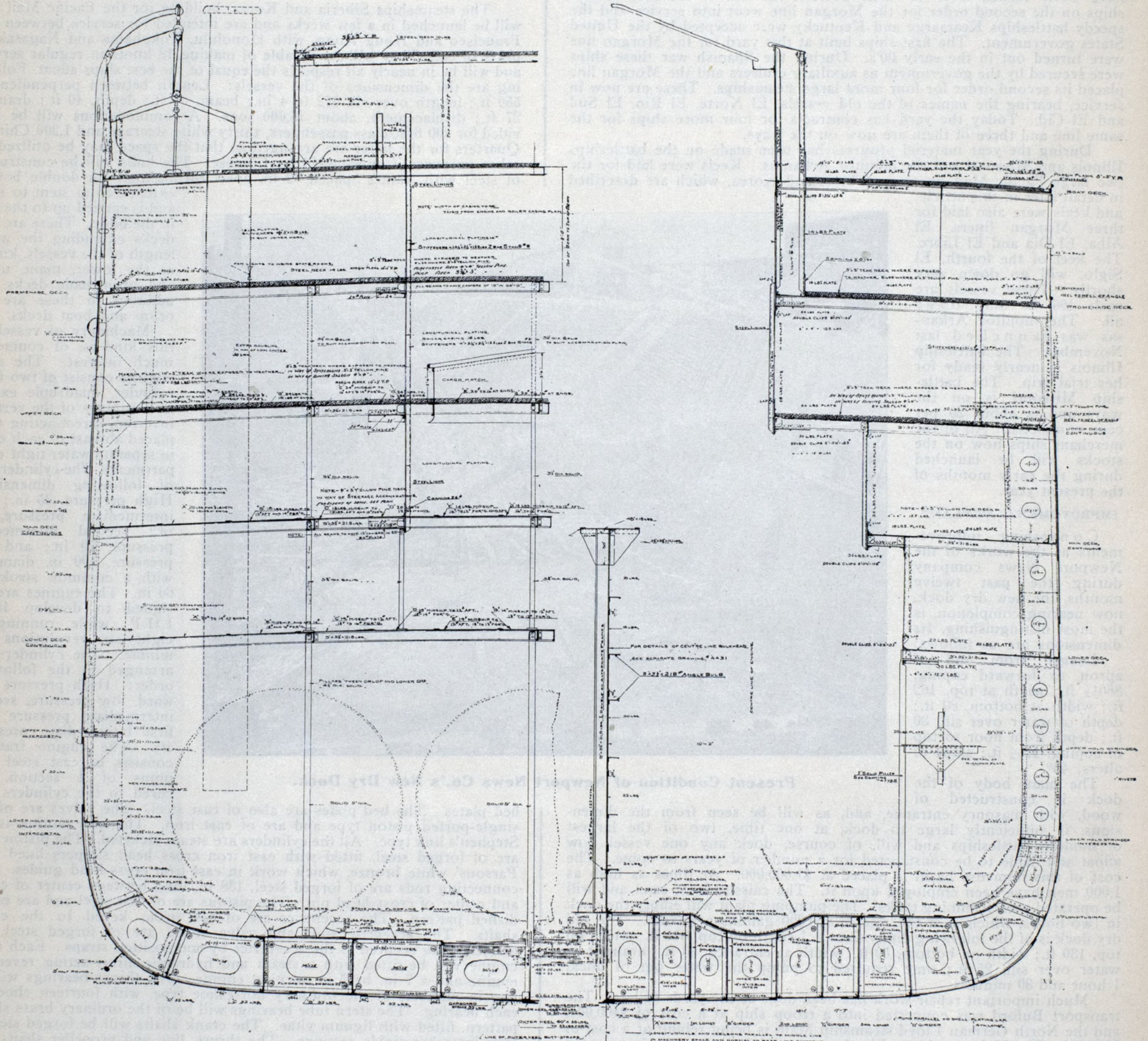
Frames—Within double bottom to be formed of $3\frac{1}{2} \times 3\frac{1}{2}$ in. by 11.1 lb. angles and to extend in one piece from $7\frac{1}{2}$ in. off center line to margin plate throughout the entire length of double bottom. Outside double bottom to be formed of $6 \times 3\frac{1}{2}$ in. by 15.3 lb. angles, and to extend from 6 in. off margin plate to under side of upper deck stringer, except Nos. 1 to 27 and 172 to 206, which extend to underside of forecastle and poop deck stringer respectively.

extend from 6 in. of margin plate to under side of upper deck stringer; on frames 176 to 205 to extend from 6 in. off center line to 6 in. above upper deck stringer on all lines.

Floor plate—To be of 20 lbs. per square foot, excepting on boiler and engine, where they are to be 22 and 24 lbs. respectively. Longitudinals to be of 20 lbs. per square foot, excepting on the boilers and engines, where they are to be 22 lbs. respectively.

Girders in engine room—"A" girder fitted intercostally from frame 117 to 151; "B" girder fitted intercostally from 117 to 153; "C" girder fitted intercostally from 117 to 124 and also from 139 to 149; "C" girder fitted continuous from frame 124 to 139; "D" girder fitted intercostally from frame 117 to 147.

Web frames—Plates as shown on profile are 130 in. wide, fitted contin-



Cross Section of the Pacific Mail Liners.

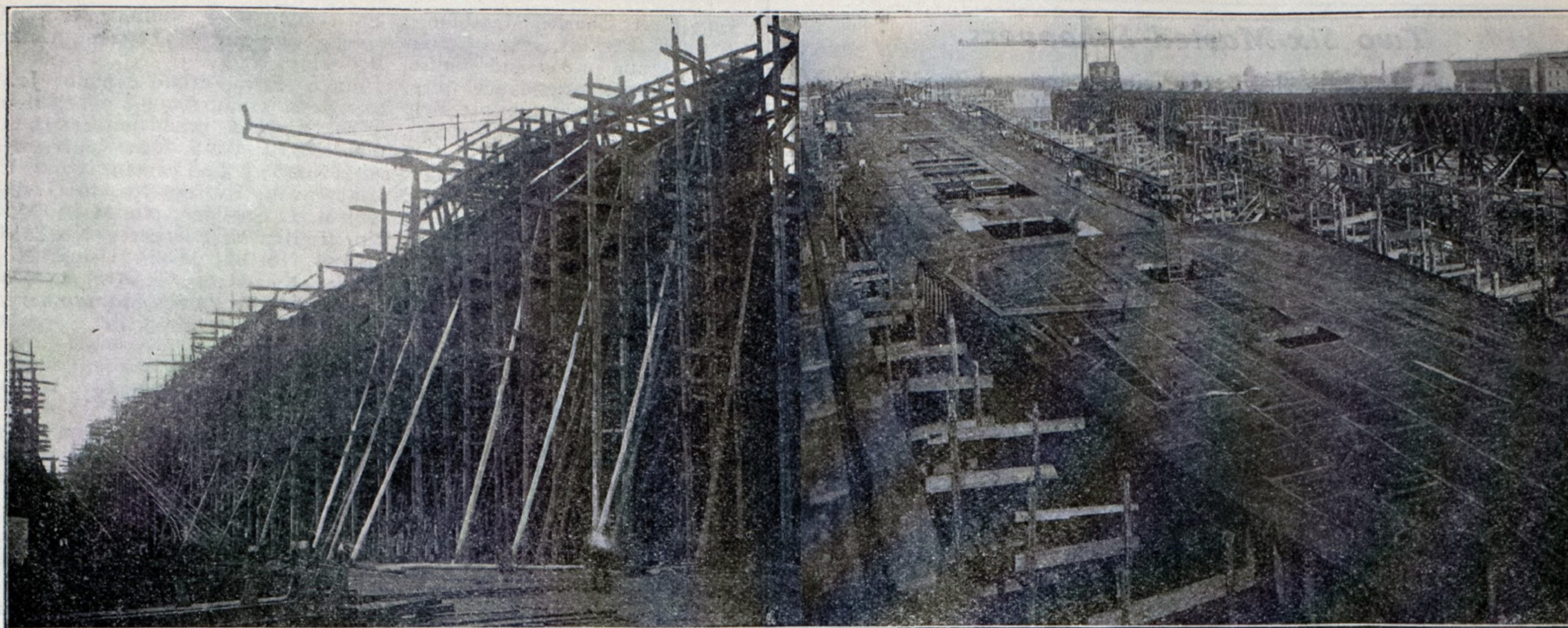
Building at works of Newport News Ship Building & Dry Dock Co.

Reverse Frames—Within double bottom in engine room $4 \times 4 \times 12$ in. by 8 lb. angles, double on frames 123 to 148 and fitted intercostally on frames 123 to 148. The remaining numbers, 141 to 148, are fitted continuous from 6 in. off center line to 6 in. from margin plate. Within double bottom in boiler room $3\frac{1}{2} \times 3\frac{1}{2}$ in. by 11.1 lb. angle, double on frames 78 to 121 inclusive, fitted continuous from 6 in. off center line to 6 in. from margin plate. Within double bottom at ends $3\frac{1}{2} \times 3\frac{1}{2}$ in. by 11.1 lb. angle, double on frames 78 to 121 inclusive, fitted continuous from 6 in. off center line to engines from margin plate. Within double bottom at ends of $3\frac{1}{2} \times 3\frac{1}{2}$ in. by 11.1 lb. single angle on frames 17 to 77 and 148 to 174. Angle fitted continuous from 6 in. off center line to 6 in. off margin plate. Outside double bottom to be $5 \times 3\frac{1}{2}$ in. by 13.6 lbs. single angle and fitted on frames 3 to 26; on even numbers to extend from 6 in. of margin plate to under side of forecastle deck stringer; on odd numbers to extend from 6 in. of margin plate to 6 in. of upper deck; on frames 28 to 74 to

uous from margin plate to lower deck, except where orlop deck is built. Fitted intercostally between decks, from angle to shell, $4 \times 3\frac{1}{2}$ in. by 11.9 lbs. Reverse frame or face angle, $4 \times 3\frac{1}{2}$ in. by 11.9 lbs., fitted from margin plate to orlop or lower deck, as the case might be, or intercostally between decks.

Bulkheads in holds—Placed horizontally and vary in thickness. The two bottom strakes to be 22 lbs., and strake immediately under lower deck 18 lbs., stiffened vertically and horizontally with $9 \times 3\frac{1}{2}$ in. by 21.8 lbs. angle bulb stiffeners.

Between bulkhead decks—Lower and main decks to be plated horizontally, bottom strake 16 lbs. and top strake 14 lbs., and stiffened vertically with $6 \times 3\frac{1}{2}$ in. by 13.5 lbs. angle stiffeners; between main and upper decks to be plated vertically with 12 lb. plate and stiffened with $4 \times 3\frac{1}{2}$ in. by 11.9 lb. angles. Boundary angles to be $3\frac{1}{2} \times 3\frac{1}{2}$ in. by 11.1 lbs. Main frame to extend from top of bulkhead to 3 ft. off margin plate. Double



Pacific Mail Liners on the Stocks at the Newport News Ship Building & Dry Dock Co.'s Works, Newport News Va.

framing to extend from top of bulkhead to 1 ft. 6 in. off margin plate. Boundary angles over tank top to be 4x4 in. by 12.8 lbs. and carried over tank edge and tugged against main and double frames.

Keel plate—Outer keel plate butt to be double, stiffened; outside straps to be 32 lbs. and inside straps to be 28 lbs. Inside straps fitted from toe to vertical keel angle over lap of garboard. Outer strap fitted from lap of garboard, port side, to lap of garboard, starboard side, in one piece. Inside keel plate butt to have single straps of 36 lbs. and fitted from toe of vertical keel angle over lap of garboard strake. All the above to be treble riveted.

Bath Iron Works, Bath, Me.

During the past year the Bath Iron Works, Bath, Me., has launched and has had under construction several merchant vessels, including transfers Nos. 13 and 14, for the New York, New Haven & Hartford railroad, launched Feb. 10, 1900. Dimensions of these tug boats are as follows: Length over all, 134 ft. 6 in.; molded length on water line, 116 ft. 6 in.; molded breadth of beam, 25 ft. 9 in.; depth, molded, 16 ft. 3 in.; gross tonnage, 322. They are supplied with two three-furnace single-ended Scotch boilers and compound engines of 22 and 48 in. cylinder diameters by 36 in. stroke. These boats, as will be noted, are supplied with enormous boiler



Launch of Monitor Nevada.

Building at Bath Iron Works, Bath, Me.

power, thus enabling them to run with screenings or other low grade fuel, or they may be steamed with one boiler while the other is being cleaned. They are supplied with forced draft for the boilers, and a complete electric light plant is fitted, including search light.

The Bath company is also building a sea-going tug boat for the Staples Coal Co. of the following dimensions: Length over all, 166 ft.; breadth of beam, molded, 29 ft. 4 in.; depth, molded, 18 ft. 9 in. This vessel has a bunker capacity of 350 tons. A Williamson steam steering gear is fitted and also a complete electric plant, including search light. The vessel has two single-ended Scotch boilers, each having three furnaces. As will be seen by the size of the coal bunkers and the boilers, this vessel has great steaming radius and power. The engine is triple expansion, with cylinders of 17, 25 and 43 in. diameter and 30 in. stroke, with a working pressure of 185 lbs. to the square inch. This vessel is to be named the Cuba.

Of the vessels under construction for the United States government the torpedo boats Bagley and Barney and the United States monitor Nevada have been launched. The torpedo boat Biddle is on the stocks with

machinery installed, complete, ready to steam as soon as launched, and the cruiser Cleveland is also in an advanced stage on the stocks. The torpedo boats Bagley, Barney and Biddle are identical and of the following dimensions: Length between perpendiculars, 157 ft.; beam, 17 ft.; depth, 10 ft. 9 in.; displacement on trial, 167 tons; guaranteed speed 28 knots for two hours' run; indicated horse power, about 4,000. These vessels are each fitted with two Normand water tube boilers of the return-flame type, each boiler having 59 sq. ft. of grate surface and 2,800 sq. ft. heating surface. As will be noted, about 34 H.P. is obtained per square foot of grate on these vessels. The vessels are fitted with twin screws, each operated by a three-cylinder triple expansion engine, with cylinders of 17¼, 24¾ and 37¾ in. diameter by 21 in. stroke; revolutions at 4,000 H.P., 306 per minute. These vessels are completely equipped with electric light plants, including search light and all the apparatus usually specified by the navy department for vessels of this class.

The monitor Nevada is of the following dimensions: Length over all, 255 ft.; length on water line, 252 ft.; beam, 50 ft.; draught complete, 12 ft. 6 in. This vessel was launched Nov. 24, 1900. The main engines and all the auxiliary machinery are now installed on board the vessel. All the wood armor backing is fitted and caulked. One-third of the side armor is in place, and the barrette armor, conning tower, smoke stack and ventilator armor are in place.

The cruiser Cleveland is of the Denver class, and of the following dimensions: Length on normal load water line, 292 ft.; breadth of beam, 44 ft.; displacement at 15 ft. 9 in. mean draught, 3,200 tons; guaranteed speed at this displacement, 16½ knots. All the interior iron work on this vessel and the outside plating is completed, and the bottom of the vessel is riveted and caulked ready to fit the outside sheathing. It is expected to finish the sheathing and launch the last week in July of this year.

A steel caisson is also being built at these works for the Portsmouth navy yard dry dock of the following dimensions: Length, extreme, 104 ft. 2 in.; breadth, molded, 22 ft.; depth from bottom of keel to under side of upper deck, 30 ft. 6 in. The caisson is to be supplied with a locomotive boiler and inverted vertical engine of sufficient power to operate two capstans and a pump.

This firm has been awarded the contract to build one sheathed battleship of the Pennsylvania class, at a cost of \$3,590,000. This vessel, described in full elsewhere, is of the following dimensions: Length on load water line, 435 ft.; breadth, extreme, at load water line, 76 ft. 10 in.; trial displacement, 15,000 tons; guaranteed speed at this displacement, 19 knots. This vessel is to have twenty-four boilers of the water tube type for working pressure of 265 lbs. to a square inch. The boilers are to supply steam to two four-cylinder triple expansion engines of an aggregate horse power of 19,000. The main battery of this vessel will consist of four 12-in. breech-loading rifles of forty calibers in length; eight 8-in. breech-loading rifles forty-five calibers in length; twelve 6-in. breech-loading rapid-fire rifles of fifty calibers in length. The secondary battery is as follows: Twelve 3-in. (14-pounder) rapid-fire guns of fifty calibers in length; twelve 3-pounder semi-automatic guns; four 1-pounder heavy automatic guns; four 1-pounder heavy rapid-fire guns; two 3-in. field pieces; two machine guns, .30 caliber; six automatic guns, .30 caliber; two submerged torpedo tubes. The company has also just received an award for one of the three protected cruisers for the United States navy at a cost of \$2,750,000.

The steam capstans, windlasses and other auxiliary apparatus of like nature on the vessels built by this company are supplied by the Hyde Windlass Co. of Bath, Me. It will be seen by reference to the chief constructor's monthly report of percentage of completion of vessels under construction for the United States navy, that the vessels at the Bath Iron Works in every case are at the head of their respective classes.

During the past year the compressed air plant has been trebled in capacity by the addition of two Ingersoll-Sergeant electric-driven compressors, together with a large increase in the piping system for the distribution of this power to the various parts of the establishment. Authority has been obtained to extend the wharf line and building slips 150 ft. into the river, and it is proposed to do that by adding an L wharf on the river side of the present wharves, with a 90-ton derrick located upon it. This will double the present wharf capacity of this establishment. A large building is also to be erected to accommodate carpenter's lumber, patterns, and for the storage of articles supplied by the government for the various naval vessels under construction. Negotiations are pending in several directions for more land in order to increase the size of the building capacity of the plant.

Two Six-Masted Schooners.

One of the distinctive bits of ship building during the year has been the construction of two six-masted wooden sailing vessels—the first of their kind to be built anywhere in the world. Such success has attended the operation of these vessels that H. M. Bean of Camden, Me., is contemplating the construction of a seven-masted schooner during the present year. The first of the six-masters to be launched was the schooner George W. Wells, built to the order of John G. Crowley of Taunton, Mass., at the ship yard of Harvey M. Bean at Camden, Me. She was launched Aug. 14 and is of the following dimensions: 345 ft. over all; 302 ft. 11 in. keel; 48 ft. 6 in. beam, and 23 ft. deep. She has two full decks with a poop 4 ft. deep extending from the taffrail to the forward hatch. Her frame is white oak throughout and all her planking and ceiling hard



Six-masted Schooner George W. Wells.

Built by H. M. Bean, Camden, Me.

pine. The garboards are 8 in. thick, other planking 6 in.; her ceiling to the lower deck beams is 12 and 14 in. thick. A notable feature of the construction of this vessel is her keelson, which is 13 ft. high aft, running up to a height of 17 ft. forward. In ordinary vessels a man can easily climb over the keelson, but in this schooner it extends up to the lower deck beams, which are bolted to it, and so it acts as a great backbone to strengthen the vessel. This keelson is built of hard pine timbers, 14 in. square, and is fastened with fifty tons of $1\frac{3}{8}$ in. iron bolts. The six lower masts are splendid sticks of Oregon pine, each 119 ft. long and 30 in. in diameter in the partners; the top masts are 58 ft. long, the foretopmast being 20 in. in diameter in the cap. The jibboom is 75 ft. long and 20 in. in diameter in the cap. The driver boom is 75 ft. long and 18 in. in the slings. The other booms are 42 ft. long and 14 in. in the slings. All the standing rigging is of wire, set up with turn buckles. The masts are named as follows, beginning forward: Foremast, mainmast, mizzenmast, spankermast, jiggermast and drivermast. The vessel will carry 12,000 yards of the heaviest duck in the following pieces: Driver, jigger, spanker, mizzen, main and foresails; six gaff topsails of the same respective designations; driver, jigger, spanker, mizzen and maintopmast staysails, five jibs. She carries a cargo of 5,000 tons and can be handled by a crew of fourteen men.

The six-masted schooner Eleanor A. Percy was launched last October from the ship yard of Percy & Small, Bath, Me. The ship builders are her managing owners. She is 323 ft. 5 in. over all; 301 ft. $7\frac{1}{2}$ in. keel; 50 ft. beam and $24\frac{1}{2}$ ft. deep. The stem and stern posts are of white oak. The frame is hack and hard wood with white oak futtocks. There are 101 square frames molded 17 in. at the breech, and to gunwale $7\frac{1}{2}$ in., sided from 11 to 14 in. The ceiling is yellow pine, 14 in. to the hanging knees streak. The keelson has a plate of steel between third and fourth streaks, 1 in. thick and 28 in. wide, running from end to end, bolted through and through with $1\frac{1}{4}$ in. iron every 9 in. and riveted. The plate is 290 ft. in length. There is also a steel trap on each side, running fore and aft 140 ft. from the center of the vessel at an angle of 15 degrees. The straps start at the top of the poop deck. About 6 ft. below these on each side is another steel truss plate running fore and aft 100 ft. from the center at the same angle. These straps are $\frac{3}{4}$ in. thick and 12 in. wide. They are bolted through frame and ceiling and riveted, four bolts to every frame. There are seven cargo hatches for loading and discharging the cargoes. The planking is selected yellow pine. The lower masts are of Oregon pine, each 122 ft. long.

American Association of Masters and Pilots.

At the annual meeting of the American Association of Masters and Pilots of Steam Vessels, held in Washington recently, committees were appointed to wait upon the war department, the light-house board and the secretary of the treasury to suggest improvements in channels and to secure additional lights. The secretary of the treasury's attention was called to a constant violation of the custom laws on Alaskan waters and Behring sea. The charges preferred by California harbor No. 15 were so grave that an investigation will be held.

The following officers were elected: Capt. John C. Silva, grand captain, Boston, Mass.; Capt. M. P. Usina, grand first pilot, Savannah,

Ga.; Capt. Charles Maytham, grand second pilot, Buffalo, N. Y.; Capt. Benj. F. Perkins, grand captain's clerk, Camden, N. J.; Capt. Luther B. Dow, grand purser and counsel, Brooklyn, N. Y.

Those in attendance were: John C. Silva, grand captain; John T. Fowler, grand first pilot; Ben Mirrieles, grand second pilot; Benj. F. Perkins, grand captain's clerk; Luther B. Dow, grand purser; P. A. W. Griggin, harbor No. 1; N. L. Cullen, No. 2; W. S. Van Keuren, No. 3; W. S. Durkee, No. 4; John H. Pruitt, No. 5; J. L. Leaman, No. 6; Ulster Davis, No. 7; W. A. Mears, No. 9; A. W. Halsey, No. 10; Irving P. Grace, No. 11; L. Champlin, No. 12; M. L. Spedden, No. 14; A. M. Haladay, No. 18; Charles H. Wells, No. 21; Ben M. Mirrieles, No. 26; C. C. Townsend, No. 29; W. C. Robertson, No. 31; M. P. Usina, No. 36; Charles Maytham and M. J. Halloran, No. 41; L. T. Brogan, No. 42; George E. Hardy, No. 43; A. C. Majo, No. 44; James Montgomery, No. 46, and R. W. England, No. 47.

Light-ship for Diamond Shoals.

Light-ship No. 72, which was launched last September from the yards of the Fore River Engine Co., Weymouth, Mass., has just undergone her trial trip with results eminently satisfactory to the members of the United States light-house board. She will leave at once for her post on the Diamond shoals off Cape Hatteras, the most perilous office that any vessel in the world has to fill. She is constructed especially for her dangerous duties and is the staunchest craft of her kind in the world. If she holds her own with the tidal race she will be the only vessel that has ever done so. All efforts to build light-houses and establish light-ships on these treacherous sands have failed. Light-houses have been blown down and light-ships blown away. Light-ship No. 72 is therefore the best product of engineering skill in this line. This light-ship will be steam propelled and electric lighted. She is 112 ft. between perpendiculars, with a molded beam of 28 ft. 6 in., and a depth of 14 ft. $10\frac{1}{2}$ in., measured from the main deck beams to the top of the keel amidships. The vessel has three decks, the main and spar deck running the full length of the ship, while the lower deck is broken by the forward coal bunker and the after bulkhead of the engine room. The hull is divided by water tight steel bulkheads into five compartments and the quarters and staterooms are so arranged as to meet all requirements of safety and comfort.

The dynamos and engines for the electric light plant are located on the main deck, and within the engine and boiler casing. The accommodations for the crew are forward on the main deck. There are two hollow steel masts, through which the wiring for the masthead flash lights is to run. These lamps, three in number on each mast, are adapted for electricity or oil. The cluster masthead lights are 59 ft. above the water line, the measurements being taken from the 12-ft. water line to the focus of the lamps. The electric plant will be driven by two non-condensing, double-cylinder engines, running under a steam pressure of 80 lbs. to the square inch. The vessel will be lighted by eighty 16-candle-power 100-volt lamps, which will be placed where necessary throughout the ship. The masthead cluster consists of six 100-candle-power 100-volt lamps, and these lights will be controlled by an automatic flashing device. It will be driven by a belt from the dynamo shaft and a worm and worm wheel which serve to



Light-ship No. 72, for Diamond Shoals off Cape Hatteras.

Built at Fore River Engine Co., Quincy, Mass.

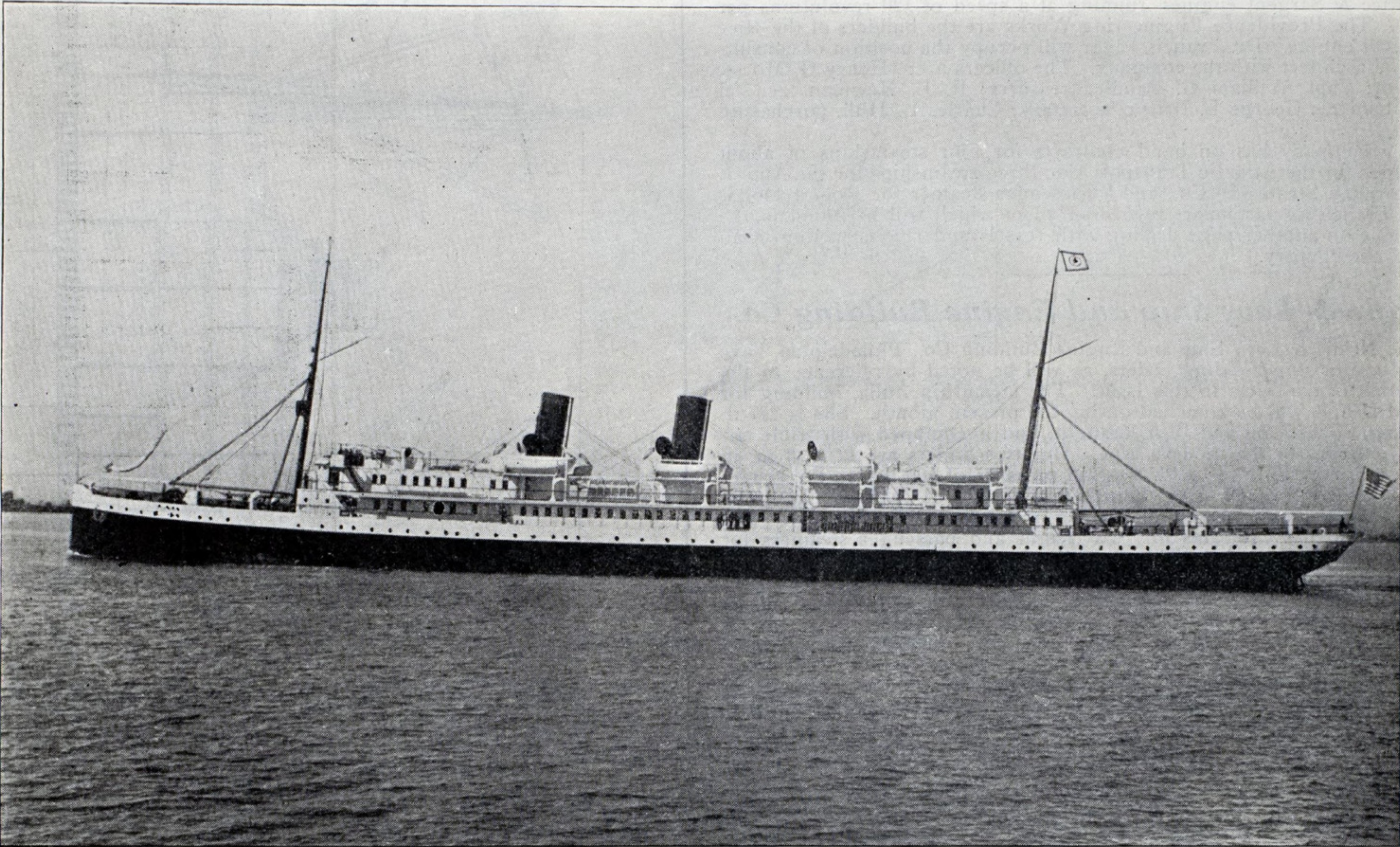
give the proper rotary speed to a circuit breaker. The light-ship is propelled by an inverted, surface-condensing, single-cylinder engine of 250 I.H.P., with a cylinder 23 in. in diameter and 22 in. stroke, driving a cast iron propeller 7 ft. 3 in. in diameter. Steam is supplied by two straight, cylindrical, tubular boilers, 9 ft. by 16 ft. $7\frac{1}{2}$ in., with a working pressure of 100 lbs. to the square inch. The light-ship will be moored by a heavy mushroom anchor, shackled to a chain which will lead through the main hawser hole in the stem of the ship to a steam windlass. In addition to this mooring tackle the vessel will have a 2,000-lb. harbor anchor, a kedge weighing 340 lbs. and 120 fathoms of $1\frac{1}{8}$ -in. stud link chain with a breaking strength of 79,100 lbs. Amidships, on either beam, are swung two whaleboats of about 26 ft. length and 6 ft. beam. The spar deck is protected by a gradually rising steel waist, which starts flush a little forward of abreast the foremast, flaring somewhat at the knightheads until at the stem propeller it has a depth of 5 ft. In addition to a powerful steam whistle the light-ship will be provided with a steam siren for use in thick and foggy weather.

Sierra of the Oceanic Steamship Co.'s Service.

The steamship Sierra, recently built by the William Cramp & Sons Ship & Engine Building Co., Philadelphia, for the Oceanic Steamship Co.'s service, finished her maiden trip from New York to San Francisco only a short time ago. It is worthy of note that in doing so she broke all previous records by seven days. Her sister ships are the Sonoma and Ventura. These vessels are under contract with the United States government to maintain a fast mail service every three weeks from San Francisco to Auckland, and Sydney via Honolulu and Samoan islands. This new service will shorten the time between the terminals, San Francisco and Sydney, from twenty-five days, the time of the run heretofore, to twenty days. The dimensions of the vessels are: Length, 425 ft.; beam, 50 ft.; tonnage, 6,000; horse power, 8,000. The new vessels have double bottoms, water tight compartments, two sets of triple expansion engines and twin screws that will drive them at over 17 knots an hour. There are no steamers at present in the Pacific trade that compare with these fast vessels. There are accommodations for 240 first-class passengers, 100 second-class passengers and 100 steerage, and in each class nothing has been left undone that will tend to the safety and comfort of travelers. The ships are

for the Ward line, a description of which will be found in this issue. The Sierra, which was launched during the year from these yards, will also be found described elsewhere. She is one of the Oceanic Steamship Co.'s liners and her sisters are the Ventura and Sonoma. The Russian cruiser Variag was completed and attained a maximum speed of 24.6 knots, which has not been equaled by any naval vessel of like character in the history of the world. The Russian battleship Retvizan was launched in the fall. The battleship Maine is now on the stocks and will take the water sometime during the present month. It is the purpose to launch her if possible on Feb. 15, the anniversary of the destruction of her namesake. The battleship Alabama, built by this company, underwent her trial trip during the year and achieved a signal success, making a mean speed of 17.013 knots and a maximum speed of 18.03 knots.

The company has under way, in addition to the two liners for the International company, two steamers for the Clyde line, each 291½ ft. long; a cruiser 351 ft. long for the Turkish government, and has just received contracts for two armored cruisers, each 506 ft. long, for the United States navy. The steamer Esperanda, for the Ward line, was launched from the yard on Saturday last. The vessel is 341 ft. long, 47 ft. 6 in. beam, and has a draught of 20 ft. Her dead weight capacity is 3,000 tons. The



Steamer Sierra for the Oceanic Steamship Co. Her sisters are the Ventura and Sonoma.

Built by the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia.

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built to comply with navy regulations and can be turned into auxiliary cruisers inside of thirty-six hours. The upper deck cabins are all of large size, lighted and ventilated by large windows opening on the upper deck. These cabins, both as regards size, light and comfort, give the appearance of rooms in a modern hotel, rather than on an ocean liner. The entrance to the cabins is from the central hall instead of from the deck. The social hall, dining room, bath rooms, toilets, etc., are also reached under cover. The dining room is a splendid airy hall, running clear across the ship, situated on the upper deck away from the kitchen. The ventilation of these steamers is perfect, as they are built especially for the trade in which they are to engage. They are provided with an elaborate draft system which entirely frees them from the closeness and odors frequently found on ocean steamers. They are all of good beam and provided with bilge keels.

Wm. Cramp & Sons Co., Philadelphia.

The great works of the William Cramp & Sons Ship & Engine Building Co. at Philadelphia have enjoyed a season of unusual prosperity and there are contracts in hand aggregating over \$20,000,000. During the year a number of most important extensions have been made at these works. The property owned by the Lehigh Valley Railroad Co., contiguous to the ship yard on the south and southwest, was purchased. It contains 11¼ acres. On this property a machine shop 332 ft. long and 140 ft. wide has been erected during the year and equipped with modern tools. A power house is also under way, which, when completed, will be the most perfect of its kind, being practically fire-proof and built with a view to economy in distributing the power to the various shops. Two new slips and three new piers have been completed on the river front of this property, and on the slips are building the two ships for the International Navigation Co. now under contract. Between these slips a large gantry crane has been erected. The ship yard adjoining, formerly operated by the Charles Hillman Ship & Engine Building Co., was purchased. This yard is operated under the title of the Kensington Ship Yard Co., though all its stock is held by the Cramp company. It is devoted to repair work. The company launched during the year the steamship Morro Castle

contract calls for a continuous speed of 16 knots and a registry of 17 knots on the trial trip. It is expected that she will be able to sail from Morro Castle at the mouth of Havana harbor to the Scotland light-ship in two and a half days. She will have accommodations for seventy first-cabin, forty second-cabin and seventy-five steerage passengers. The vessel is equipped with a complete outfit of Blake air pumps, including vertical twin air pumps of the United States pattern. Her sister ship, the Monterey, will be launched in April.

Ship Building in January.

The United States bureau of navigation reports that fifty-one vessels of 11,434 gross tons were built in the United States and officially numbered during the month of January, 1901, as follows:

	WOOD.				STEEL, STEAM.*		TOTAL.	
	SAIL.		STEAM.					
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross
Atlantic and gulf.....	24	5,293	10	473	1	175	35	5,941
Pacific.....	1	86	2	55			3	141
Great lakes.....			2	125	1	4,153	3	4,278
Western rivers.....	3	71	7	1,003			10	1,074
Total.....	28	5,450	21	1,656	2	4,328	51	11,434

*No steel sailing vessels.

The largest vessel in the list was the steel steamer Wilkesbarre of 4,153 gross tons, built by the American Ship Building Co. at Buffalo for package freight service between Chicago and Buffalo. The foregoing figures do not include craft without motive power of their own. From other sources than construction two vessels of 2,671 gross tons were added to the merchant fleet.

New York Ship Building Co., Camden, N. J.

Of the new ship yards established during 1900 that of the New York Ship Building Co. at Camden, N. J., is by all odds the greatest. The plant represents an initial investment of \$6,000,000. It deserves a far more extensive notice than is given in this article, but the company is not as yet prepared to furnish an official description of the plant. The plant is the most unique in the country, and probably in the world, in that its operations are entirely under cover. The biggest battleship afloat could be built in this yard under shelter. The plant comprises works for the complete construction of a ship, including engines and boilers. The tract of land comprises 130 acres with a frontage on the Delaware river of 3,600 ft; floor space of all buildings, 22 acres; lineal feet of dock front, 3,100; depth of water at either side of fitting-out slips, 30 ft. at low tide. The building slips at present can accommodate a hull of 700 ft. and are capable of indefinite increase as far as hulls are concerned. The plant is entirely fire-proof; all material will be handled by traveling cranes; all the machinery is new and of the most modern type, and many special tools have been constructed and installed. The special feature of the plant is the almost exclusive use of electricity as a medium of power transmission. The power plant consists of two 500 kw. monocyde generators, which also furnish current for lighting, and which are directly connected by two 750 H.P. Rice & Sargent engines, running at a speed of 120 revolutions per minute. The Providence Engineering Works are the builders of the Rice & Sargent engine. Dr. Francis Elgar will occupy the position of consulting naval architect with the company. The officers are: Henry G. Morse, president; Capt. William G. Randle, treasurer; R. L. Newman, general superintendent; George L. Brown, secretary; Charles L. Hull, purchasing agent.

The company has on hand contracts for four steamships of about 12,000 tons for the Atlantic Transport Co., three steamships for the American-Hawaiian Steamship Co., and a passenger steamer for Robert Dollar of San Francisco, particulars regarding all of which will be found in the large table on another page dealing with vessels under construction in all parts of the country.

Neafie & Levy Ship and Engine Building Co.

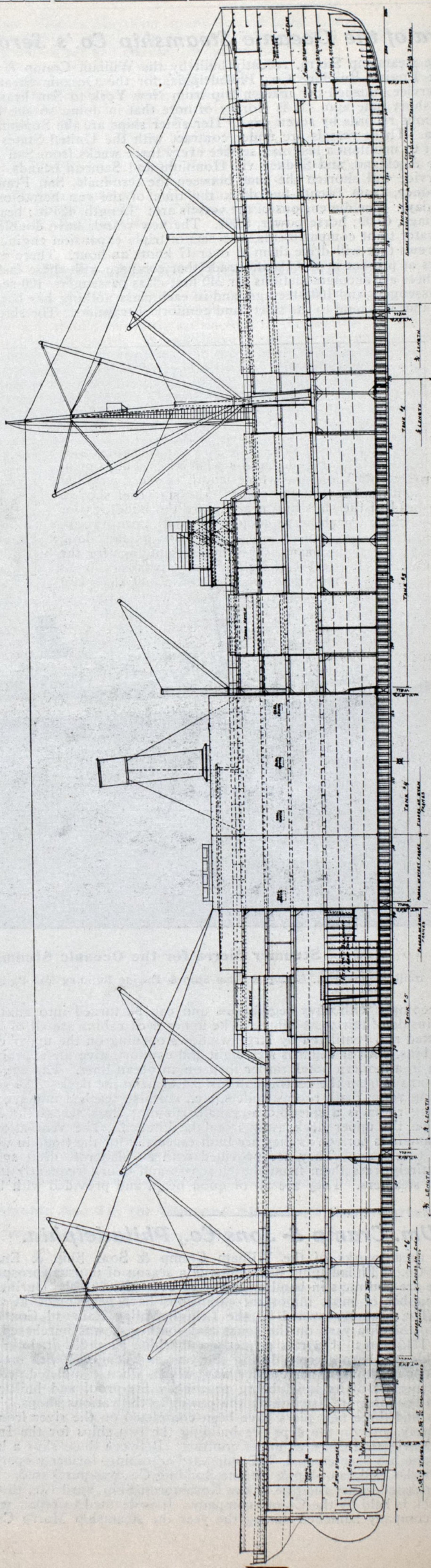
The Neafie & Levy Ship and Engine Building Co., Philadelphia, have a full share of ship building orders, as will be noted by reference to the large table of contracts in this issue. The steamship Zulia, building for the Red D line, will be launched during the present month. She is 277 ft. 6 in. long, 37 ft. beam and 19 ft. draught, and is equipped with triple expansion engines of the modern type. Her two boilers are 12 ft. 3 in. in diameter, 12 ft. 8 in. long, with a steam pressure of 160 lbs. to the square inch. The three torpedo boats, Bainbridge, Barry and Chauncey, are nearing completion, and the cruiser Denver is fairly well under way. The company also has contracts for two freight and passenger steamers for the Delaware river service. These vessels are each to be 162 ft. in length, 33 ft. beam and 8 ft. 3 in. deep. They will have twin screws and will each be equipped with two triple expansion engines with cylinders of 10, 15 and 23 in. diameter and 18 in. stroke. Boilers of locomotive type, two in each ship, will be 5½ ft. diameter and 20 ft. long. Another order is for a pilot boat for the pilots of Galveston, Tex. This vessel will be 112 ft. long, 23 ft. beam and 13 ft. deep, and will be propelled by compound engines of 16 and 32 in. cylinder diameters and 24 in. stroke, supplied with steam from a boiler of 12 ft. diameter and 11 ft. length. On the list of new steel vessels is also a sea-going tug for the South Atlantic Towing Co. of Brunswick, Ga. Dimensions and other leading particulars of this vessel are: Length, 120 ft.; beam, 22½ ft.; depth, 12½ ft.; triple expansion engine with cylinders of 14, 21 and 26 in. diameter and 26 in. stroke; boiler, 13 ft. diameter and 12 ft. long. A contract has also been secured for a wooden tug boat. This vessel will be 110 ft. long, 23 ft. 8½ in. beam and 10 ft. 6 in. in depth. Engines will be compound, 18 and 36 by 26 in., and the boiler will be of 13 ft. diameter and 12 ft. length. Orders for a triple expansion engine and a compound engine and for three boilers are also on the company's books. This company is also one of the three successful bidders for the construction of a protected cruiser for the United States navy, bids for which were opened by the navy department last Friday. The fireboat Samuel H. Ashbridge, which the company recently delivered to the city of Philadelphia, is considered to be the finest in the country.

Argument in Favor of Sheathed Ships.

A recent report from Capt. Cooper, commanding the battleship Iowa, the flag ship of the Pacific squadron, notes a great reduction in the speed of that vessel, owing to a foul bottom. The Iowa went into dock last in May of 1900, nearly eight months ago, and on her recent cruise down the Pacific coast showed a falling off of nearly 15 per cent. in her regulation speed. A diver's inspection disclosed a bottom rank with sea weed and shells. Capt. Cooper in his report to Rear Admiral Kautz, urges that the vessel be docked for a thorough cleaning and painting at the earliest practicable moment, and as the Iowa has just arrived back from her southern cruise, it is probable that his request will be complied with immediately, as the naval regulations require that under no circumstances shall more than nine months elapse without docking, unless by special authority from the secretary of the navy. The experience with the Iowa is regarded as a significant argument in favor of sheathed battleships.

Supplement to Iron and Steel Directory.

Mr. James M. Swank, general manager of the American Iron & Steel Association, Philadelphia, has just issued a supplement to the directory to the iron and steel works of the United States with a full list of consolidations in the iron and steel industries. It is bound in cloth and contains a list of thirty companies, embracing all that have consolidated since Jan. 1, 1898. The name and the character of the plant are fully stated. For detailed information concerning the plants mentioned and their products reference is given to the page or pages in the directory in which they are fully described. Iron ore mines, coal mines, coke ovens, railroads and lake vessels owned by the consolidated companies are also given in sufficient detail. The price of the supplement is \$2.



For description see page 28.

Outboard Profile of Boston Steamship Co.'s Two Vessels.

Building at Maryland Steel Co.'s Yard, Sparrow's Point, Md.

Fore River Engine Co., at Quincy Point.



ONE of the progressive New England concerns, the Fore River Engine Co., which has just been awarded the contract for building the two unsheathed battleships Virginia and Rhode Island, has completed the moving of its plant from Weymouth to Quincy Point. The torpedo boats Lawrence and Macdonough and light-vessel No. 72 are being fitted out at the new yard and they will soon be ready for delivery to the government. The United States sheathed protected cruiser Des Moines is the first vessel started at the Quincy yard. She is now in frame and the manganese bronze stem and stern post will be in place

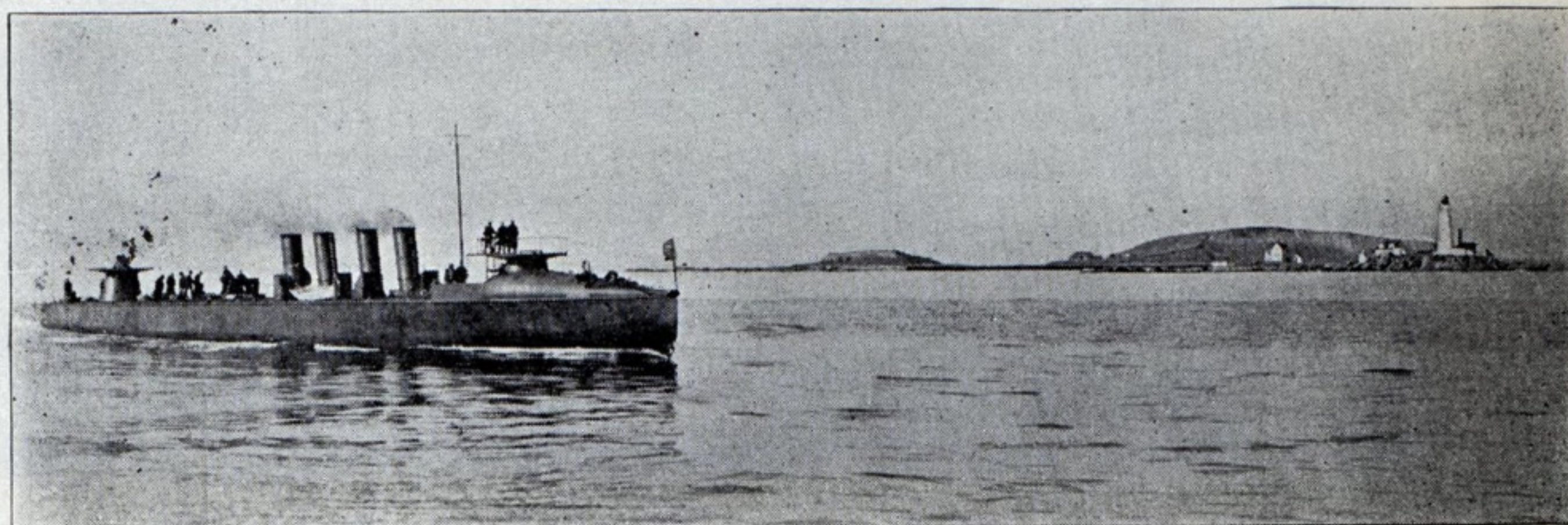
modern tools, capable of handling the heaviest ship work—plate and angle furnaces, bending slabs and schrive board, and anglesmith shop. The machine shop is 250 ft. long and 120 ft. wide, with galleries, the total floor space being 37,000 sq. ft. This shop is fitted with the most modern machine tools. The smaller tools are in the galleries, and on the lower floor are tools for the heaviest class of work, including two lathes (114 ft. long) for turning and boring shafts. This shop has a 25-ton overhead electric crane with tracks running the full length of the building. The building for wood-working machinery is 304 ft. long and 72 ft. wide. On the lower floor is the pattern shop, joiner shop and mill. The mold loft is on the upper floor with a clear floor space the whole length and width of the building. The store house is 165 ft. long and 72 ft. wide, with two floors. The power house is 105 ft. long and 65 ft. wide, containing boilers of 1,000 H.P. capacity, compound engines, driving electric generators in units of 250 H.P., air compressors, pumps for hydraulic accumulators, etc. The system of electrical distribution is through underground conduits leading into all the buildings, where the power is applied to all the large tools by direct-connected motors operated on the multi-voltage system.

Lawrence.

in a few days. The company has 70 acres in its new plant, which is finely equipped for building the largest type of vessels complete with all machinery, including the making of its own heavy forgings. The lay of the land is such that there will be over one mile of water front for wharves and about one-half mile for launching slips, with a depth of 35 ft. at mean high tide. There is a natural basin formation running the whole depth of the plant, which is being dredged to a depth of 35 ft. and a width of 175 ft. This basin will be about one-half mile long and on the south side of it are the construction shops, launching slips, store houses and timber sheds. On the north side of the basin will be the "fitting out wharves." The launching slips extend about the whole length of the river front at the south portion of the plant. The ship tool shop is at the head of the slips and near by are the buildings for wood-working machinery, mold loft and store rooms. The machine shop, power house and forge extend along the quay wall of the basin. The smaller buildings for the coppersmiths, pipe-fitters and plumbers, galvanizers, brass foundry and painters, have been placed about the plant most handily for their usage. The larger buildings are so arranged about the plant that they can be lengthened or otherwise enlarged to keep pace with further developments of the ship building industry. All the main buildings have granite foundations and granolithic floors. The foundations for the ship building slips are also of granite. Railroad tracks encircle the yard with branches running through the buildings and to the slips and wharves, equipped for handling and hauling material to any portion of the yard.

GENERAL DESCRIPTION OF THE SHOPS.

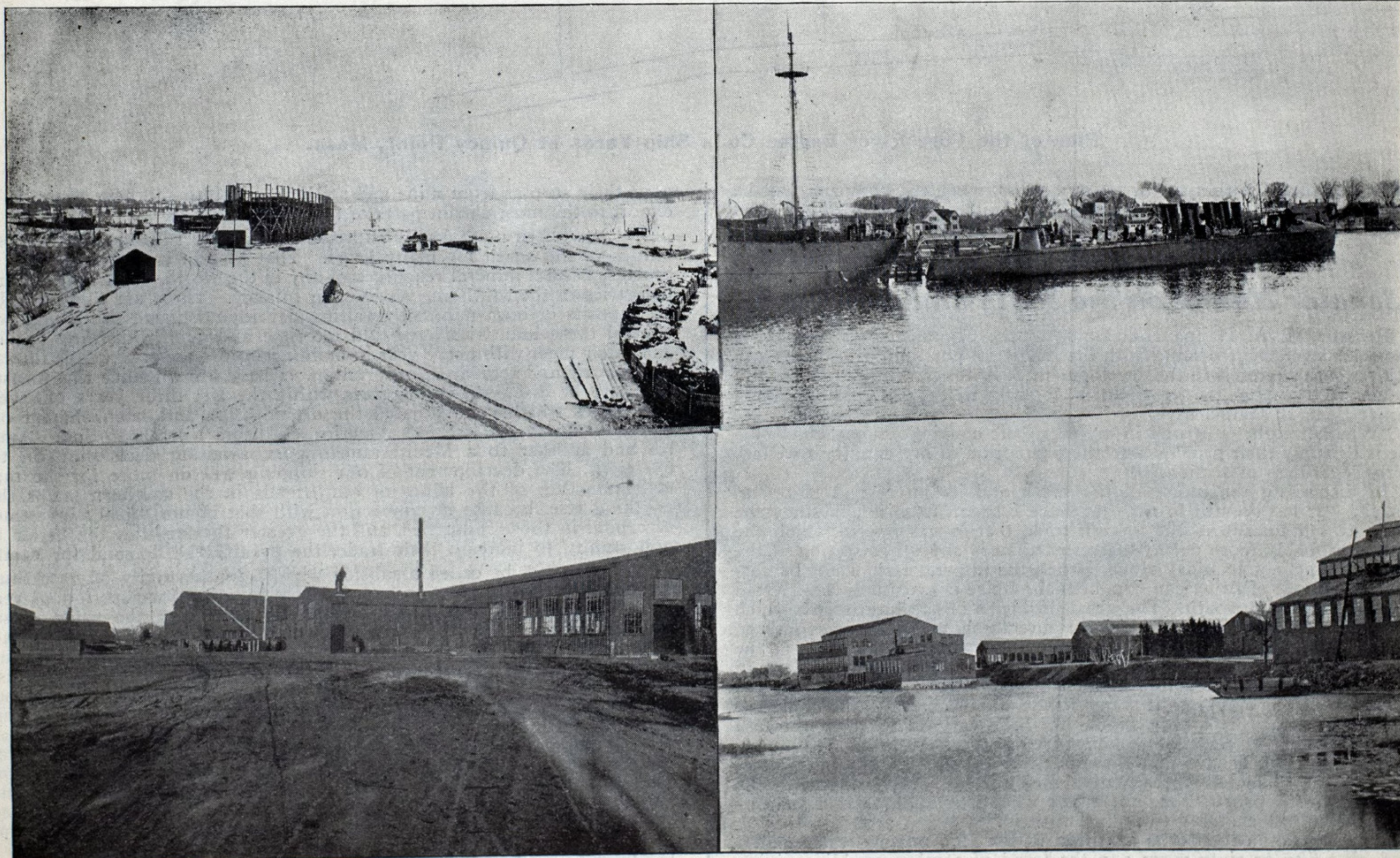
The ship tool shop is 400 ft. long and 72 ft. wide, and contains all



Torpedo Boat Lawrence. First trial of machinery. Very little water disturbance. Hull vibration not perceptible.

All the buildings have the Sturtevant hot air blower system for heating in winter and cooling in summer; also for exhausts and blasts in forge and blacksmith's shops, and draft in power house. The entire plant is equipped with a compressed air system for operating pneumatic tools for riveting, calking and chipping, power being furnished by air compressors located in the power house. The forge shop is equipped with one 20-ton, one 5-ton and one 3-ton hammer, besides several hammers, forges and

The Fore River Engine Co.'s Plant.



VIEW FROM MACHINE SHOPS LOOKING TOWARDS BUILDING SLIP.

MACHINE SHOP, POWER HOUSE, SHIP FITTERS' SHOP, WOOD WORKING DEPARTMENT, STORE AND FORGE.

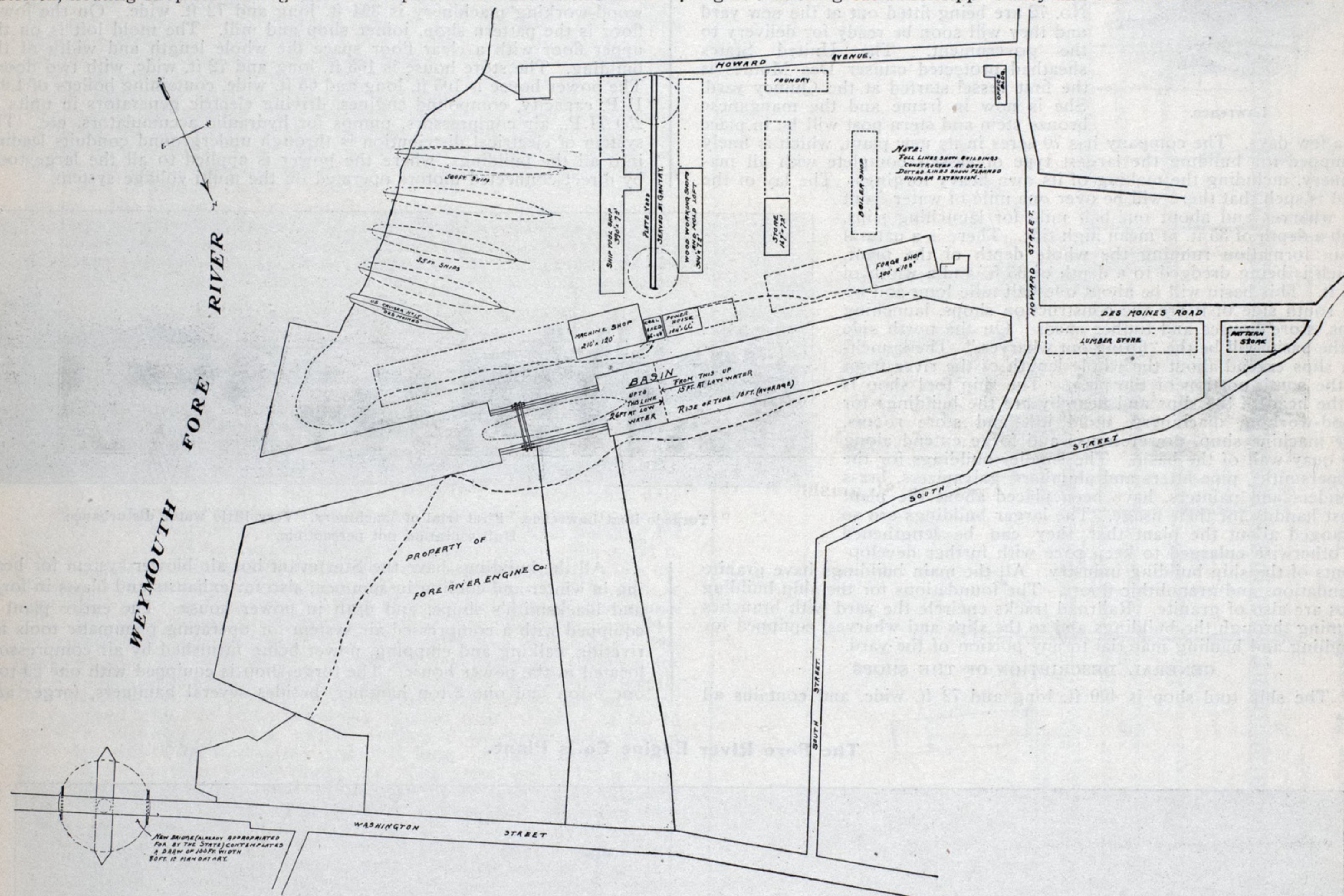
TORPEDO BOAT MACDONOUGH; LAWRENCE IN REAR.

VIEW LOOKING DOWN BETWEEN SHIP TOOL SHOP AND WOOD-WORKING SHOP. SHIP TOOL SHOP ON THE RIGHT, MACHINE SHOP AND POWER HOUSE IN DISTANCE.

forging machines for small work, 25-ton overhead electric forge crane and all the appliances for handling nickel steel billets, with the necessary heating and annealing furnaces and oil-tempering baths for the treatment of nickel steel forgings. The main office of the company is on the first floor of a four-story building 140 ft. long by 30 ft. wide; the second story is reserved for government officials and the third and fourth floors for the technical offices of the company.

In addition to the buildings and plant already described, all of which is now in working order and in operation, the following additions are now being either designed or in process of construction: Boiler shop, cranes over building slips, cranes over basin, sectional floating dry dock, floating derrick, floating shop for "fitting out" and repair work. All of this work

in raising cotton went to the foreign ships that carried it to Europe was dwelt upon more than sixty years ago, and it was asserted that the south would be infinitely better off if that money were paid to American ship-owners, and thus kept at home, employing our own people. Even southern state legislatures felt impelled forcefully to appeal to the national government for direct aid in order to secure frequent and regular sailings of American ships with American cargoes to distant lands. The intervention of our great civil war diverted the minds of southern men away from those channels through which their material welfare could be best advanced. With the upbuilding of our shipping, supplemented by the creation of an isthmian canal going hand in hand, there is everything to suggest that the great Mississippi Valley and the whole southern section will



Plan of the Fore River Engine Co.'s Ship Yards at Quincy Point, Mass.

will be completed within six or eight months, when the company will be possessed of one of the most complete ship building plants in the United States, capable of building any vessel, large or small.

Senator Hanna on the South and Shipping.

Senator M. A. Hanna contributes to the Manufacturers' Record a comprehensive article dealing with the industrial possibilities of the south and the south's interest in the development of American shipping. In giving his views upon the possibilities looking to the upbuilding of the country Senator Hanna says:

"Whether right or wrong in my economic convictions, my chief purpose is to apply their principles to the promotion of my country's welfare utterly regardless of section."

In discussing the future of the south and its interest in shipping, he says: "It has seemed to me ever since I began to seriously study the subject of our marine in the foreign trade that it was one in which the south is probably more deeply interested than is any other section of the union, looking not to today alone, but to the future. I shall not be surprised if the seat of American commercial empire is eventually transferred from the east to the south. The great problems of the future with which American statesmen must deal strike directly home to every southern interest. I regard the revival of our shipping in the foreign trade as the most immediately pressing of all our great national problems. Next in importance is the construction of an isthmian canal. But steps for the re-creation of our shipping, it seems to me, should precede the construction of any canal. Not only should we have cargoes to carry through such a canal, but we should also be assured of the ships in which to carry them. I shall not believe that the industrial, the mercantile, the agricultural and the financial representative men of the south differ with me upon this broad proposition, no matter what is said in their behalf by those in congress claiming to represent them."

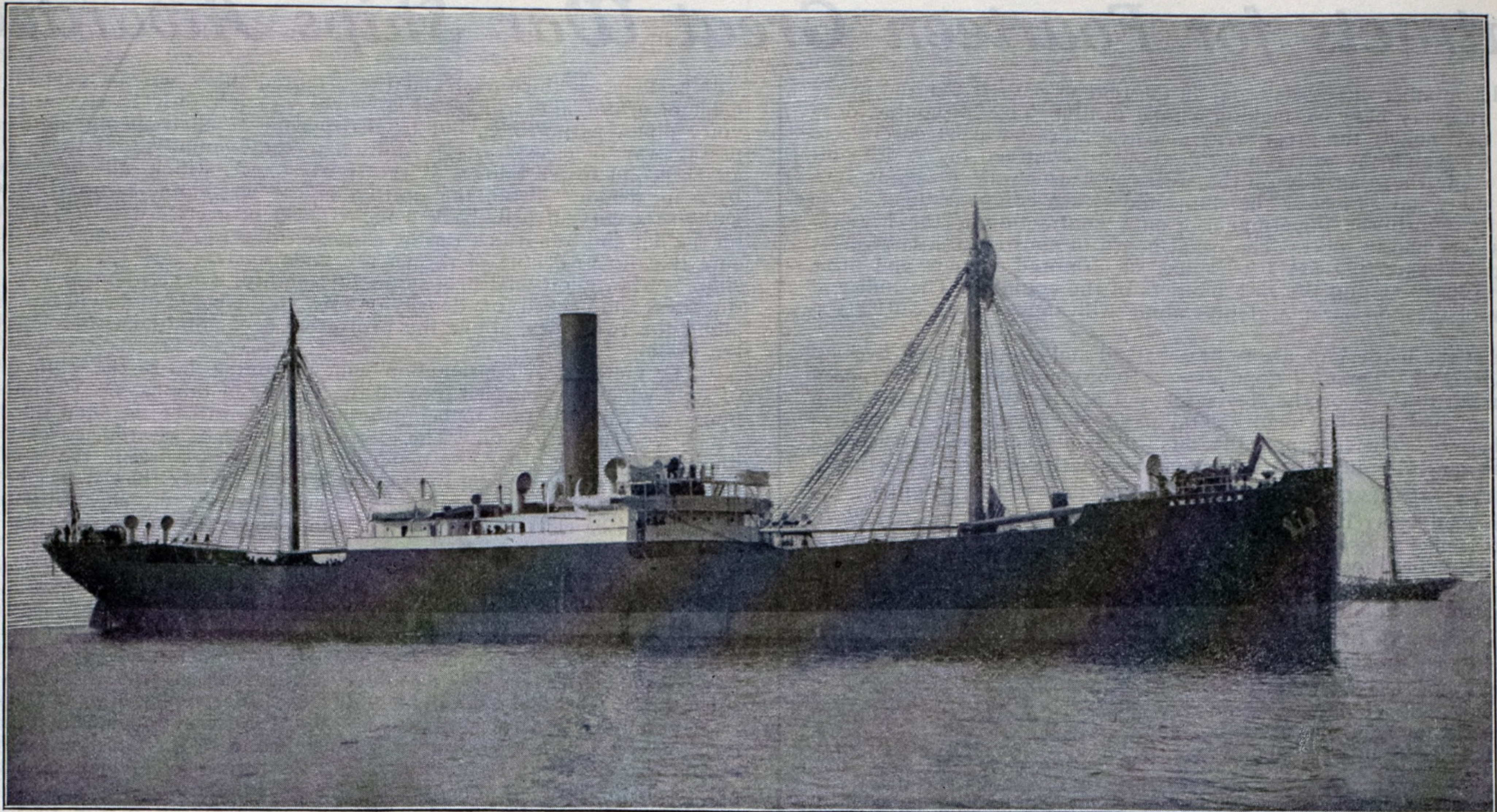
Senator Hanna then calls attention to the fact, not generally understood, that fifty or sixty years ago the trend of southern public opinion was then fully abreast, if not leading the north, in respect to American shipping interests and adds:

"Southern commercial organizations then, as now, placed themselves squarely on record in favor of direct national help in the creation of American lines of ships. The fact that so much southern money earned

pour their surplus from mine and soil and mill into southern seaports for export to the most distant parts of the world.

"I have been most deeply impressed with the resources and the possibilities of the south for many years. That section is endowed with the greatest natural mineral resources of any in the world. The coal and iron industries in the south are yet in their infancy. There are there wonderful deposits of both minerals awaiting development, and the people who control these industries have told me time and again that the one difficulty they meet with every year in building up the export trade is the lack of adequate and regular transportation. I have known since this measure began to be discussed in congress within the last three years of several enterprises which contemplated the organization and establishment of a line from Pensacola to South America, one from Norfolk to South America and another to a Mediterranean port, awaiting decision upon this question. The development of our shipping will do more for the rapid consummation of the hopes of our friends in the southern states than anything else, because in connection with that comes further investment of capital in those industries, and the greater the facilities the better the opportunity to increase their trade, the greater the demand for capital.

"It may not be called a subsidy when a southern city offers through its municipal government to exempt from taxation for a period of years all industries employing many people and enhancing the value of surrounding property by the stimulation of business in every line of trade. Counties occasionally bond themselves to induce railroads to pass through them, turning the proceeds of the bond sale over to the railroads as a bounty, or as a subsidy, or as a bonus—whatever you will. The presentation of large tracts of land to corporations looking for sites for mills and factories may be regarded as enterprising and commendable if it add to your population, to your employment, to your prosperity and to your welfare; and who will quarrel as to the proper term with which to characterize the aid that was inducement sufficient to bring such a condition about? A similar condition exists upon the sea. The business is there, and it can be made profitable to our own people, and by our own people, acting as a whole instead of as a section. The things that citizens in localities are willing to do to secure the establishment of new and profitable industries in their midst they must be willing to do as a part of the entire nation to secure the establishment of a shipping of our own upon the high seas. And whether it be called government aid, or subsidy, or bounty matters not so long as the inducement is sufficient to attract capital into it."



American Steamship for the American-Hawaiian Steamship Co.

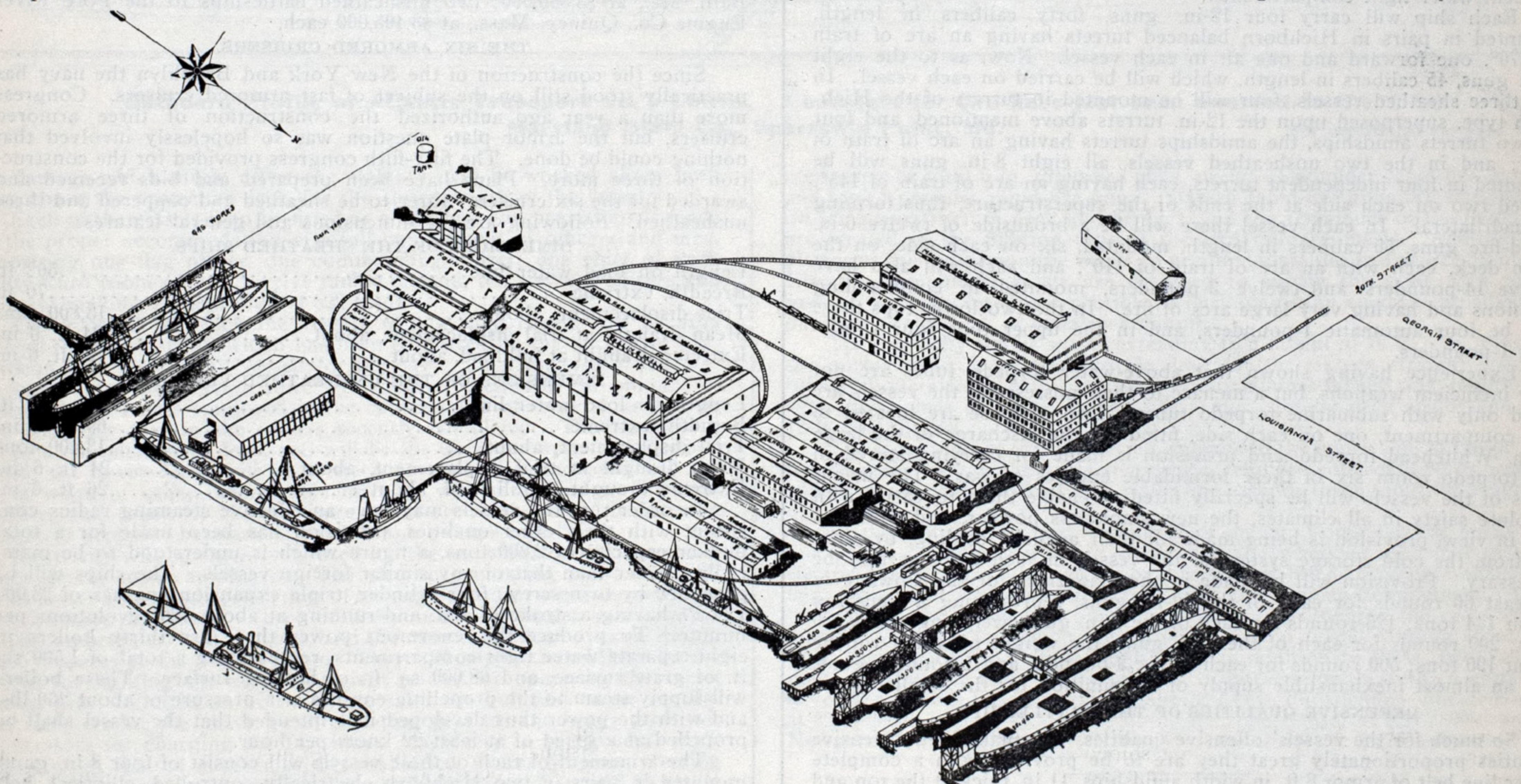
435 FT. OVER ALL, 51 FT. BEAM, 33½ FT. DEEP, 8,250 TONS CARGO CAPACITY AND 12 KNOTS SPEED. BUILT AT ROACH'S SHIP YARD, CHESTER, PA.

Risdon Iron Works, San Francisco.

Progress upon the new ship building plant which the Risdon Iron Works is erecting in San Francisco is entirely satisfactory to the officials of the company, who announce that the yard will be ready for ships of any size or kind within the next few months. The company has several contracts on hand at the present time and is rushing the erection of steel buildings and the installment of tools as fast as it can be done. Liberal orders have been placed with eastern manufacturers for tools of all descriptions used in the construction of steel vessels of such sizes as to

is founding is the most significant evidence of the great development which is expected in Pacific coast ship building, a development which is sure to grow with the export trade of the nation. The company is at present building two vessels; one the twin-screw wooden steamer George F. Haller, 108 ft. long, for the North Alaska Salmon Co.; the other a steel steamer, 138 ft. long, for L. D. Baker of Boston.

Mr. Robert Curr, who is well known among ship builders and ship owners on the great lakes, is to take the position of ship building superintendent of the Risdon works. He made a tour of the principal eastern yards and manufactories of tools before leaving for the Pacific coast.



Plan of the Ship Yards of Risdon Iron Works, San Francisco, now under construction.

meet the requirements of cruisers and battleships. A bird's-eye view of the new works in this issue gives a good general notion of the arrangement of the different steel buildings now in course of construction. The plant is arranged with a view to the utmost economy in handling material. The company has an area of about 35 acres and a water frontage of about 2,000 ft. which, however, will be increased by means of wharves.

During the past year this company remodeled the Pacific Steam Whaling Co.'s tow boat Shelikof, which is 121 ft. over all, 23 ft. beam and 9 ft. 6 in. deep; and also the stern-wheel steamer Potrero. When the plant is fully equipped the Risdon Iron Works will become an energetic competitor of other ship yards on the Pacific. The plant which this company

It is announced from Berlin that eight new German warships will be completed and placed in commission this year, including the battleship Kaiser Wilhelm der Grosse, with a displacement of 11,152 tons; the twin vessels Kaiser Barbarossa and Kaiser Karl der Grosse, the cruiser Prinz Heinrich, with a displacement of 8,881 tons, and four small cruisers. Five battleships, one armored cruiser and one gunboat are building and two battleships, one armored cruiser and three protected cruisers will be placed under contract during the present year.

The Monongahela Dredging Co., Pittsburg, Pa., is to build a new dredge at a cost of \$20,000.

Contracts for Fourteen Great War Ships Awarded.

THE number of vessels today in the regular navy is 254 and in the auxiliary navy 56, making a total of 310. This, of course, does not include the great array of battleships and armored cruisers for which the government is about to contract, but it does include those already on the stocks and which are dropping into the water as fast as the ship builders can complete them. The program for which the government is now contracting is the heaviest that it has ever had to meet. The naval board of construction is at present engaged in parceling five battleships, six armored cruisers and three protected cruisers among the ship builders of the country. The hull and machinery of these fourteen warships alone will approximate \$40,000,000 in value.

Three of the battleships are to be sheathed and coppered and two are to be unsheathed. Three of them also are to be equipped with superposed turrets, similar to those on the Kearsarge and Kentucky, and two of them are to be supplied with the quadrilateral arrangement of the 8-in. guns in the main battery. The superposed turrets will be placed upon the sheathed ships. The general dimensions and chief characteristics of the vessels are:

GENERAL DIMENSIONS OF SHEATHED AND COPPERED VESSELS.

Length on load water line.....435 ft.
Breadth, extreme, at load water line.....76 ft. 10 in.
Trial displacement, about.....15,000 tons.
Mean draught at trial displacement, about.....24 ft.
Greatest draught, full load, about.....26 ft.

GENERAL DIMENSIONS OF UNSHEATHED VESSELS.

Length on load water line.....435 ft.
Breadth, extreme, at load water line.....76 ft. 2½ in.
Trial displacement, about.....14,600 tons
Mean, draught, at trial displacement, about.....24 ft.
Greatest draught, full load, about.....26 ft.

In the 15,000 tons represented in each of these vessels the many antagonistic qualities essential to a perfect fighting machine have been compromised and incorporated in proportions which experience seems to have pointed out as the most desirable and efficient. To begin with, these battleships will have a speed of at least 19 knots, which compares most favorably with any battleship under construction abroad, as well as with any in the projected stage. As all of the vessels previously designed by the bureau of construction and repair have shown material excess of speed over that called for, it may be expected that this figure will be exceeded by from a quarter to a half knot.

The vessels will be propelled at this high speed by twin screws driven by two four-cylinder, triple expansion engines of about 19,000 I.H.P., having a stroke of 4 ft., running, under conditions of maximum speed, at about 120 revolutions per minute. The steam necessary to this power will be supplied at a pressure of 250 lbs. by twenty-four Babcock & Wilcox straight water tube boilers, placed four in each of six independent water-tight compartments.

Each ship will carry four 12-in. guns, forty calibers in length, mounted in pairs in Highborn balanced turrets having an arc of train of 270°, one forward and one aft in each vessel. Now, as to the eight 8-in. guns, 45 calibers in length, which will be carried on each vessel: In the three sheathed vessels, four will be mounted in turrets of the Highborn type, superposed upon the 12-in. turrets above mentioned, and four in two turrets amidships, the amidships turrets having an arc of train of 180°; and in the two unsheathed vessels, all eight 8-in. guns will be mounted in four independent turrets, each having an arc of train of 145°, placed two on each side at the ends of the superstructure, thus forming a quadrilateral. In each vessel there will be a broadside of twelve 6-in. rapid-fire guns, 50 calibers in length, mounted, six on each side, on the main deck, each with an arc of train of 110°, and each will also have twelve 14-pounders and twelve 3-pounders, mounted in commanding positions and having very large arcs of fire. In the two lower tops there will be four automatic 1-pounders, and in the upper tops four single-shot 1-pounders.

Experience having shown that above-water torpedo tubes are not only inefficient weapons, but a menace to their possessors, the vessels are fitted only with submarine torpedo tubes. Two of these are located in one compartment, one on each side, fitted for the discharge of the large 18-in. Whitehead torpedo, and provision is made for carrying stored in the torpedo room six of these formidable engines of war. The magazines of the vessels will be specially fitted to enable them to carry, with absolute safety in all climates, the new smokeless powder, and with this end in view, provision is being made for their artificial cooling, by pipes led from the cold storage system of the vessel, in such cases as may be necessary. Provision will be made in the magazines for the stowage of at least 60 rounds for each of the 12-in. guns, representing a weight of about 144 tons; 125 rounds for each of the 8-in. guns, weighing about 180 tons; 200 rounds for each of the 6-in. guns, the weight of which will be about 190 tons; 500 rounds for each of the 3-pounder and 1-pounder guns, and an almost inexhaustible supply of ammunition for the smaller guns.

DEFENSIVE QUALITIES OF THE BATTLESHIPS.

So much for the vessels' offensive qualities. To make their defensive qualities proportionately great they are to be provided with a complete water line belt of armor 8 ft. in width amidships, 11 in. thick at the top and 8 in. at the bottom, tapering to a uniform thickness of 4 in. at the ends of the vessel. They will also have an armored belt extending over 245 ft. of their length, of a uniform thickness of 6 in., rising from the top of the main belt to the upper or main deck, and joined at its after end to the barrette of the 12-in. turret by a 6-in. armored bulkhead, and having at its forward end an inclined armored bulkhead from side to side 6 in. thick, thus forming a citadel or redoubt within which the 6-in. guns will be mounted. The barbettes for the turrets of the 12-in. guns are to be 10 in. in thickness for that portion outside of the redoubt or citadel, reduced to 6 in. in thickness within. The turrets themselves will be protected by armor 10 in. in thickness, the portholes, however, being 11 in. The 8-in. turrets will in all cases, whether superposed or independent, be protected by 6 in. of armor, with 6½ in. port plates, and their barbettes will be protected by similar armor. The conning tower and its shield

will be 9 in. in thickness, and the armored tubes will be protected by 6 in. of armor and will be of sufficient size not only to receive all the voice pipes, wiring, etc., but to also permit of their being used as a passageway, if necessary. In addition to the conning tower there will be a second tower known as the signal tower, which will be protected by 5 in. armor. From the bottom of the water line armor belt there will rise a curved turtle-backed nickel steel protective deck 1½ in. thick on the flat and 3 in. thick on the sloping sides, to make assurance doubly sure that no projectile of the enemy finds its way into the vitals of the ship. As an additional protection to stability, a cofferdam belt 3 in. in thickness and packed to a density of 8 lbs. to the cubic foot, will be worked along the two sides, above the protective deck, for the entire length of the vessel.

The material of construction will, of course, be of the high quality of steel which has entered into all the vessels of our navy. The main or upper deck, in addition to being built of steel, will be the only one upon which wood is to be laid. The lower decks will be of steel, covered with linoleum or some other like material. The use of wood in the construction of the vessels will be limited even more strictly than it has been in the later battleships, and all wood except that for the sheathing of the bottom will be electric fireproofed. Bilge keels and heavy docking keels will be fitted.

It is proposed to make all of these vessels flagships, and to do this it is necessary to make provision for the accommodation of one flag officer, one commanding officer, one chief of staff, twenty ward room officers, twelve junior officers, ten warrant officers and 658 crew and marines, making a grand total of 703. Both officers and crew will have wash rooms, bath rooms and other similar conveniences, such as will place the comfort and healthfulness of these vessels very high in the scale.

The applications of electricity on board are very much wider than in the case of any other battleships in existence, with the possible exception of the Kearsarge and Kentucky. All of the turrets have electrical turning gear, and the ammunition hoists, blowers to the turrets and general ventilation, the general workshop, and practically all of the auxiliaries, outside of the engineers' department and excepting capstan and steering gear, are to be electrically driven. To provide for the power required for these purposes there will be installed in the three ships with superposed turrets, eight engines and dynamos, mounted on combination bed plates—two having a rated output of 1,250 amperes at 80 volts, and six with 625 amperes at 80 volts. The two ships with the 8-in. guns in quadrilateral arrangement will be provided with ten engines and dynamos, mounted on combination bed plates—two with a rated output of 1,250 amperes at 80 volts and eight with 625 amperes at 80 volts. The names selected for these battleships are Georgia, New Jersey, Pennsylvania, Rhode Island and Virginia. Contracts for these battleships have been awarded as follows: One sheathed battleship to Moran Bros. Co., Seattle, Wash., at \$3,723,600; one sheathed battleship to the Newport News Co., Newport News, Va., at \$3,590,000; one sheathed battleship to the Bath Iron Works, Bath, Me., at \$3,590,000; two unsheathed battleships to the Fore River Engine Co., Quincy, Mass., at \$3,405,000 each.

THE SIX ARMORED CRUISERS.

Since the construction of the New York and Brooklyn the navy has practically stood still on the subject of fast armored cruisers. Congress more than a year ago authorized the construction of three armored cruisers, but the armor plate question was so hopelessly involved that nothing could be done. The fifty-fifth congress provided for the construction of three more. Plans have been prepared and bids received and awarded for the six cruisers—three to be sheathed and coppered and three unsheathed. Following are the dimensions and general features:

DIMENSIONS OF THE SHEATHED SHIPS.

Length on load water line.....502 ft.
Breadth, extreme.....70 ft.
Trial displacement, about.....13,800 tons
Mean draught at trial displacement, about.....24 ft. 6 in.
Extreme draught at full load, about.....26 ft. 6 in.

DIMENSIONS OF THE UNSHEATHED VESSELS.

Length on load water line.....502 ft.
Breadth, extreme.....69 ft. 6 in.
Trial displacement, about.....13,400 tons
Mean draught at trial displacement, about.....24 ft. 6 in.
Extreme draught at full load, about.....26 ft. 6 in.

In order that the vessels may have an effective steaming radius consistent with their other qualities, provision has been made for a total bunker capacity of 2,000 tons, a figure which is understood to be materially greater than that of any similar foreign vessels. The ships will be propelled by twin-screw, four-cylinder, triple expansion engines of 23,000 I.H.P., having a stroke of 4 ft. and running at about 120 revolutions per minute. To produce this enormous power there are thirty boilers in eight separate water tight compartments, representing a total of 1,590 sq. ft. of grate surface, and 68,000 sq. ft. of heating surface. These boilers will supply steam to the propelling engines at a pressure of about 250 lbs. and with the power thus developed it is intended that the vessel shall be propelled at a speed of at least 22 knots per hour.

The armament of each of these vessels will consist of four 8-in. guns, mounted in pairs in two Highborn electrically controlled, elliptical, balanced turrets, placed on the middle line, one forward and one aft, each having an arc of train of at least 270°. On the upper deck, at the corners of the superstructure, there will be four 6-in. guns, mounted in sponsons, one in each corner, and each having either a bow or stern fire, with an arc of train at least 145°. There will be, in addition, the gun deck battery of ten 6-in. guns forming a broadside, five on each side, the arc of fire of each being not less than 110°, or at least 55° forward and 55° abaft the beam, excepting in the case of the forward pair, which are so arranged as to be capable of direct ahead fire. There will also be a very formidable secondary battery, consisting of eighteen 3-in. breech-loading rifles, twelve 3-pounder, two machine guns and six automatic guns of small caliber, mounted in the most commanding positions practicable, and having large arcs of fire. In the lower top there will be two automatic 1-pounders, and in the upper military top a single-shot 1-pounder. In these vessels, as in

all others of recent design, there will be no above water torpedo tubes, but provision is made for two sub-marine torpedo tubes located in one compartment forward, fitted for the long, 18-in. Whitehead torpedo.

For the guns above enumerated there will be carried 500 rounds of 8-in. ammunition, 2,000 rounds of 6-in., 4,500 rounds of 14-pounder, 6,000 rounds of 3-pounder, 2,000 rounds of 1-pounder automatic and 1,200 rounds of 1-pounder heavy ammunition. The magazines have been specially designed with a view to absolute security in all climates, special provision being made to reduce their temperature, if necessary, by means of connections with the cooling plant of the vessels.

ARMORED PROTECTION OF THE SHEATHED SHIPS.

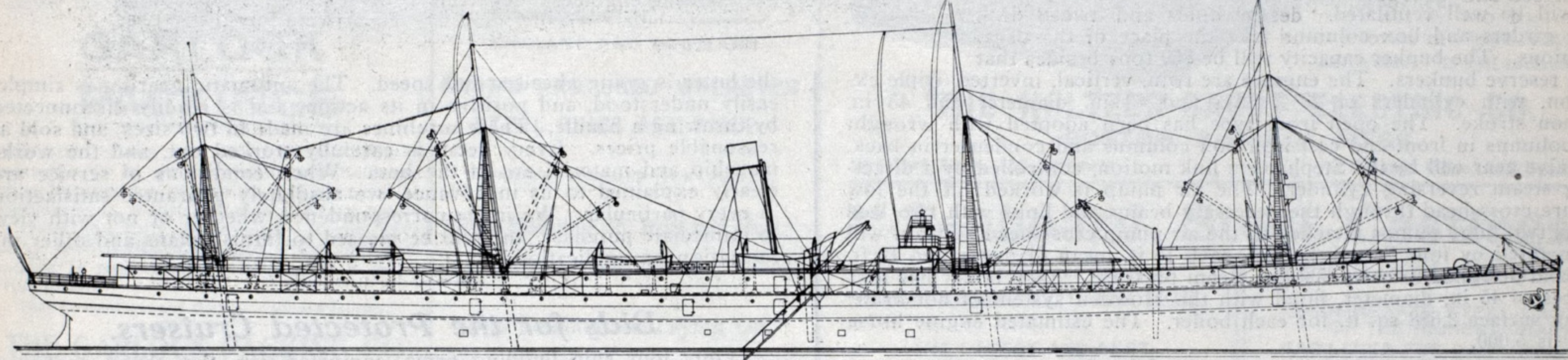
The armored protection of the vessels will consist of a water line belt 7 ft. 6 in. in width, extending from the bow to the stern of the vessel for a distance of about 244 ft. Abreast of the engines and boilers this armor will be 6 in. in thickness for its upper edge, maintaining this thickness for a distance of 4½ ft. downward, from which point it tapers to 5 in. at its lower edge. The belt is to be completed to the bow and stern by armored plates of a uniform thickness of 3½ in. Above the water line belt the side will be protected for a length of 232 ft. by a belt 5 in. in thickness, extending from the top of the water line belt to the main deck. At the ends of this armor there will be armored bulkheads 4 in. in thickness, so forming an inclosed citadel or casemate within which the ten 6-in. guns of the broadside battery are mounted. The four 6-in. guns on the upper deck, at the corners of the superstructure, are protected by 5-in. armor casemates. The turrets for the 8-in. guns will be 6 in. in thickness, with 6½ in. port plates and 1½ in. nickel steel tops. The barbettes of the 8-in. turrets will have a uniform thickness of 6 in. and the ammunition tubes, extending from the turret to the protective deck, will have a uniform thickness of 3 in. The conning tower will be 9 in. in thickness, with a 2-in. nickel steel top, and from its base to the protective deck there will be an armored tube 5 in. in thickness and of sufficient diameter not only to permit of the accommodation of speaking tubes, etc., but also access to the conning tower from below the protective deck. The signal tower aft will be 5 in. in thickness. A complete oil tempered and annealed nickel steel protective deck, 1½ in. thick on the flat and 4 in. thick on the sloping sides, is to extend the entire length of the vessel, and a cellulose cofferdam belt 3 in. in thickness, as an additional protection against water

match for anything in the protected cruiser line. These cruisers are of about 10,000 tons displacement each and are to be named St. Louis, Milwaukee and Charlestown, the latter to continue the name of the 3,500-ton vessel wrecked Nov. 2, 1899, off Kamiguin island in the Philippine group. Their general dimensions and features are as follows:

Length on load water line.....	424 ft.
Breadth, extreme	66 ft.
Trial displacement	9700 tons.
Mean draught at normal displacement.....	23 ft. 6 in.
Engines, twin screw, I. H. P.....	21000
Speed	22 knots.
Normal coal supply.....	650 tons.
Coal bunker capacity.....	1500 tons.
Armament	14 6-in. R. F. guns. 18 14-pdr. R. F. guns. 12 3-pdr. R. F. guns. 4 1-pdr. automatic. 8 1-pdr. R. F. guns. 2 3-in. R. F. field guns. 2 machine guns, 30 caliber. 8 automatic guns, 30 caliber.
Protection....	Main side armor..... 4 in. Lower casemate armor..... 4 in. Upper casemate armor..... 4 in. 6-in. gun protection..... 4 in. Conning tower and shield..... 5 in. Signal tower..... 4 in. Splinter bulkheads..... 2 in. Protective deck..... 2½ in.

The act authorizing these ships of the St. Louis class states that they shall carry "the most powerful ordnance for vessels of their class and to have the highest speed compatible with good cruising qualities and great radius of action." All these qualifications have been embodied in the design for these vessels. The general appearance of these cruisers suggests that trite quotation "a thing of beauty is a joy forever." "Beauty" and "joy" applied to these vessels means easy lines, graceful exterior, speed and the ability to sustain that prestige upon the sea which has been maintained by the navy of the republic since its origin.

The main deck of these cruisers is supplemented amidships with a covered superstructure, within which are located four 6-in. rapid-fire guns and six 14-pounder rapid-fire guns; outside the superstructure are two more 6-in. rapid-fire guns, located on the center line, one forward and the other aft. On the gun deck the greater portion of the battery is located,



Outboard Profile of Atlantic Transport Co.'s Liners. Contracts for two have just been awarded to the Maryland Steel Co., Sparrow's Point, Md.

For description see page 28.

line damage which might affect the stability, will be worked along both sides, above the protective deck, for the entire length of the vessel.

Each of the vessels is to be fitted as a flagship, and provisions is made for the proper accommodation of a full complement of officers and men, comprising one flag officer, one commanding officer, one chief of staff, twenty ward room officers, twelve junior officers, ten warrant officers and 777 crew, making a grand total of 822 souls.

The material of which the vessels will be constructed will be mild steel, of the high quality which has been employed by the bureau of construction and repair in all vessels for the navy. In pursuance of the policy inaugurated some years since by Admiral Hichborn, the amount of inflammable material employed in the construction of these ships will be even less than that in the vessels recently completed. The main deck will be a complete steel deck, and will be the only one upon which wood is laid; the lower decks will be of steel, covered with linoleum; and the use of wood or other inflammable material will be limited to the least possible, and much of the furniture, formerly made from fire-proofed wood, will probably be made of steel or some other metal.

Electricity will be extensively used for the transmission of power necessary for the many auxiliaries. The electric generating plant will consist of seven units, each consisting of an engine and dynamo mounted on a combination bed plate. Three of these units will have a rated output of 1,250 amperes each at 80 volts, and the remaining four a rated output of 625 amperes at the same voltage. They will supply, in addition to the current for lighting the vessel sufficient power for operating the turret turning gear, ammunition hoists, blowers for the hull and turret ventilation, rammers for the heavy guns, elevating gear for the heavy guns, air compressors for charging the torpedoes, machinery in the general work shop, etc. A limited number of the auxiliaries, as, for instance, steering engine, anchor and capstan engine and ash hoisting engines, will be steam driven.

The names of these armored cruisers are West Virginia, Nebraska, California, Maryland, Colorado and South Dakota. Contracts have been awarded as follows: Cramp & Sons, Philadelphia, one sheathed armored cruiser at \$3,890,000, one unsheathed armored cruiser at \$3,730,000; Union Iron Works, San Francisco, one sheathed armored cruiser at \$3,800,000, one unsheathed armored cruiser at \$3,750,000; Newport News Co., Newport News, Va., one sheathed armored cruiser at \$3,885,000 and one unsheathed armored cruiser at \$3,775,000.

THE THREE PROTECTED CRUISERS.

The three protected cruisers for which bids were opened last week by the navy department are in effect armored cruisers. They are certainly the most formidable protected cruisers afloat and are more than a

consisting of eight 6-in. rapid-fire guns, twelve 14-pounder rapid-fire guns and four 1-pounder rapid-fire guns. Sixteen rapid-fire guns are stationed on the superstructure deck and bridges, and the remainder of the battery are located in the fighting tops of the two military masts. Additional platforms are built upon the masts to accommodate the two search lights. Electric ammunition hoists are designed to supply the guns with the greatest rapidity, making it possible to hurl against an enemy a broadside of about twelve tons of metal per minute.

The four lofty smoke stacks extending to a height of 76 ft. 6 in. above the normal load water line provide draft for the sixteen straight water tubular boilers located in four water tight compartments, and together with the engines protected by the side armor, sloping deck armor and a 12-ft. coal bunker.

The inner bottom of these vessels extends to the under side of the protective deck. Above the protective deck a cellulose cofferdam 30 in. wide and 41 in. above the normal load water line extends throughout the length of the vessel.

In the construction and equipment of the St. Louis class as small a quantity as possible of wood is to be used, and wherever used it is to be electric fireproofed. Each vessel of this class is fitted to accommodate a flag officer and staff in conjunction with the regular complement. In commission the number of officers will be thirty-nine and the crew will number 525 men, for which are provided sixteen boats, ranging from a 36-ft. steam cutter to a 16-ft. dinghy, and in addition to these, two 12-ft. punts and two life rafts will be carried. Contracts for these three vessels have been awarded as follows: Neafie & Levy, Philadelphia, one cruiser at \$2,740,000; Bath Iron Works, Bath, Me., one cruiser at \$2,750,000; and Newport News Co., Newport News, Va., one cruiser at \$2,741,000.

Bids were opened a few days ago for four steel bridges by the Chicago Drainage Canal trustees. They were for structures of the bascule type over the Chicago river at Harrison street, Canal street, Main street and Ashland avenue. The American Bridge Co. were the lowest bidders for the superstructure on the first three and the Massillon Bridge Co. on the Ashland avenue superstructure. The four bridges, according to the lowest bid for superstructure and substructure, would cost \$518,871, nearly \$100,000 less than the estimate of the board.

The new battleship Illinois, sister of the Alabama and Wisconsin, building at the ship yard of the Newport News Co., will be ready for her preliminary trial about the middle of the present month and will go into commission in July.

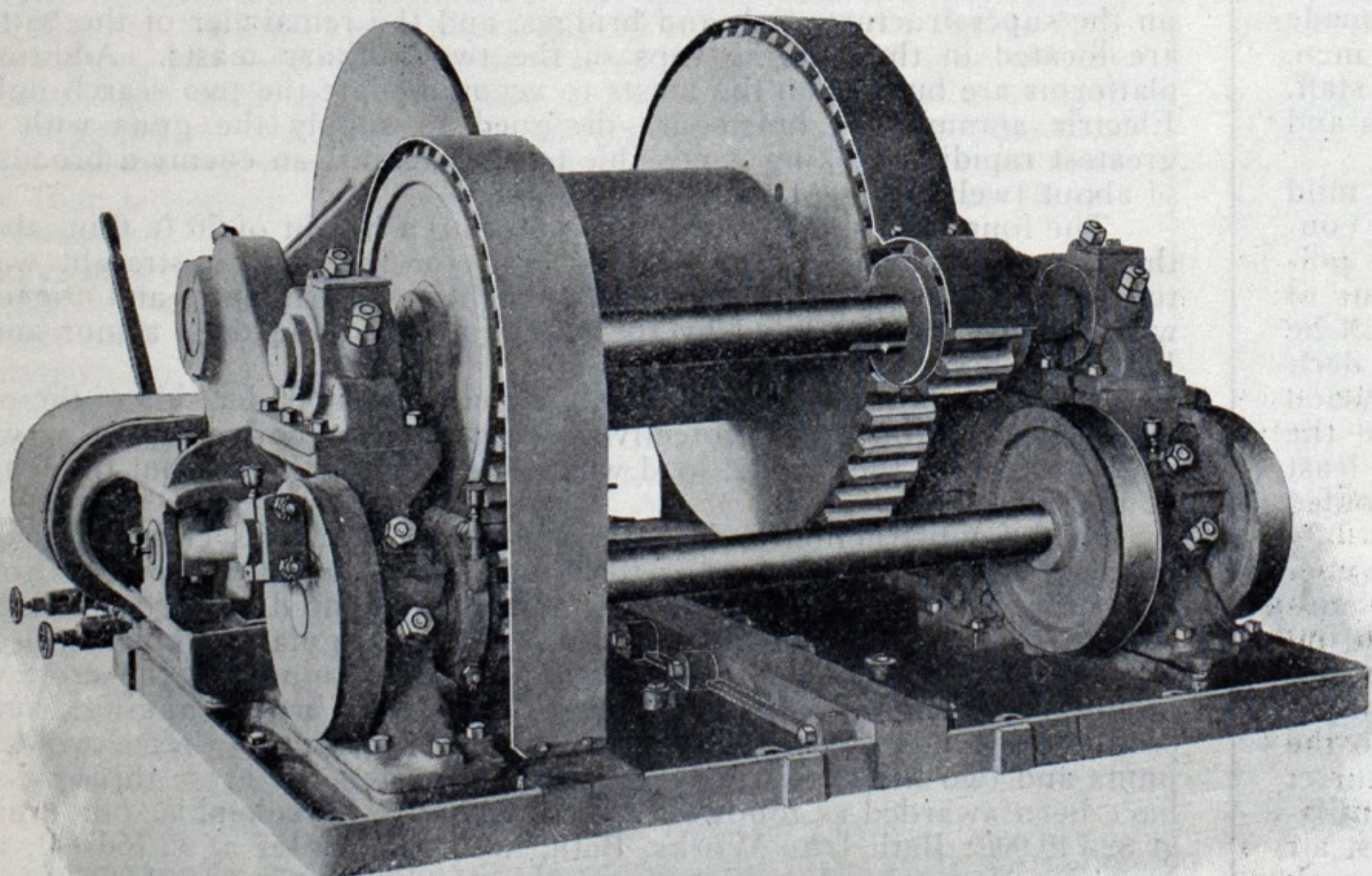
Four Very Large Cargo Steamers.

At the works of the Maryland Steel Co., Sparrow's Point, Md., there are four cargo steamships under way that are each of a little more than 500 ft. length. These freighters will attract attention for the reason that they are the outgrowth of an effort on the part of the Sparrow's Point company to turn out a class of steamers that represent the best type of ocean tramp. The marked success of the ocean tramps Pleiades and Hyades, owned and operated by the Boston Towboat Co., resulted in an order to these builders for a third ship from the same plans, except that the upper deck is continuous right fore-and-aft, instead of being interrupted by wells forward and aft of the deck houses. This ship, known in the yard as No. 34, is now in frame. Following the order for No. 34, the Boston Steamship Co., an outgrowth of the Boston Towboat Co. and backed by Kidder, Peabody Co. of Boston, contracted with the Maryland Steel Co. for two cargo ships, of which the illustration in this issue is a preliminary outboard profile. These ships are being built under the rules for highest rating, special survey of the British Corporation. Their dimensions are: Length over all, 505 ft.; length between perpendiculars, 488 ft.; beam, molded, 58 ft.; depth, molded, to main deck, 22 ft. 1 in.; depth, molded, to upper deck, 32 ft. 1 in.; depth, molded, to shelter deck, 40 ft.; draught, loaded, 27 ft.; gross tonnage, 8,950.

The dead weight carrying capacity will be 11,200 gross tons; speed, loaded, 12 knots, and light, 13.5 knots. The shelter deck will be continuous fore-and-aft, with a bridge deck 177 ft. 8 in. long amidships. Accommodations for officers and crew will be provided in houses on the bridge deck and aft on the shelter deck, with chart house and flying bridge over the officers' houses on the bridge deck. Four watertight bulkheads extending to the upper deck, two to the shelter deck and one to the main deck are specified. The last will form a deep tank up to the main deck, full width of the ship, and 30 ft. 4 in. long, with a capacity of 790 tons. The cellular double bottom, 50 in. deep, will extend from the peak tank forward to the stern tube bulkhead aft. The main, upper and shelter decks are to be steel complete. There will be nine hatches on each deck. All the holds and crew quarters will be well ventilated. In the holds and 'tween deck heavy girders and box columns take the place of the usual stanchions. The bunker capacity will be 850 tons besides that of the reserve bunkers. The engines are twin, vertical, inverted, triple expansion, with cylinders of $23\frac{1}{2}$, $39\frac{1}{4}$ and 63 in. diameter and 45 in. common stroke. The open front type has been adopted with wrought steel columns in front and cast iron box columns and condenser in back. The valve gear will be the Stephenson link motion, controlled by a direct-acting steam reversing cylinder. The air pump is worked off the low pressure cross-head through the necessary beams and links with two feed lift and two bilge pumps attached to the air pump cross-head. Steam will be generated by four Scotch boilers, each 15 ft. mean diameter and 12 ft. long, and designed to carry 200 lbs. steam pressure. Each boiler has four furnaces of 45 in. diameter, fitted with the Howden system of hot draft; heating surface 2,688 sq. ft. for each boiler. The estimated engine horse power is 5,000.

ATLANTIC TRANSPORT CO.'S SHIPS.

The general dimensions of two cargo steamers for the Atlantic Transport Co. also building at the Sparrow's Point works are: Length between perpendiculars, 490 ft.; length over all, 507 ft.; beam, molded, 56 ft.; depth to lower deck, molded, 19 ft. 8 in.; depth to main deck, molded, 27 ft. 7 in.; depth to upper deck, molded, 35 ft. 6 in.; depth to shade deck, molded,

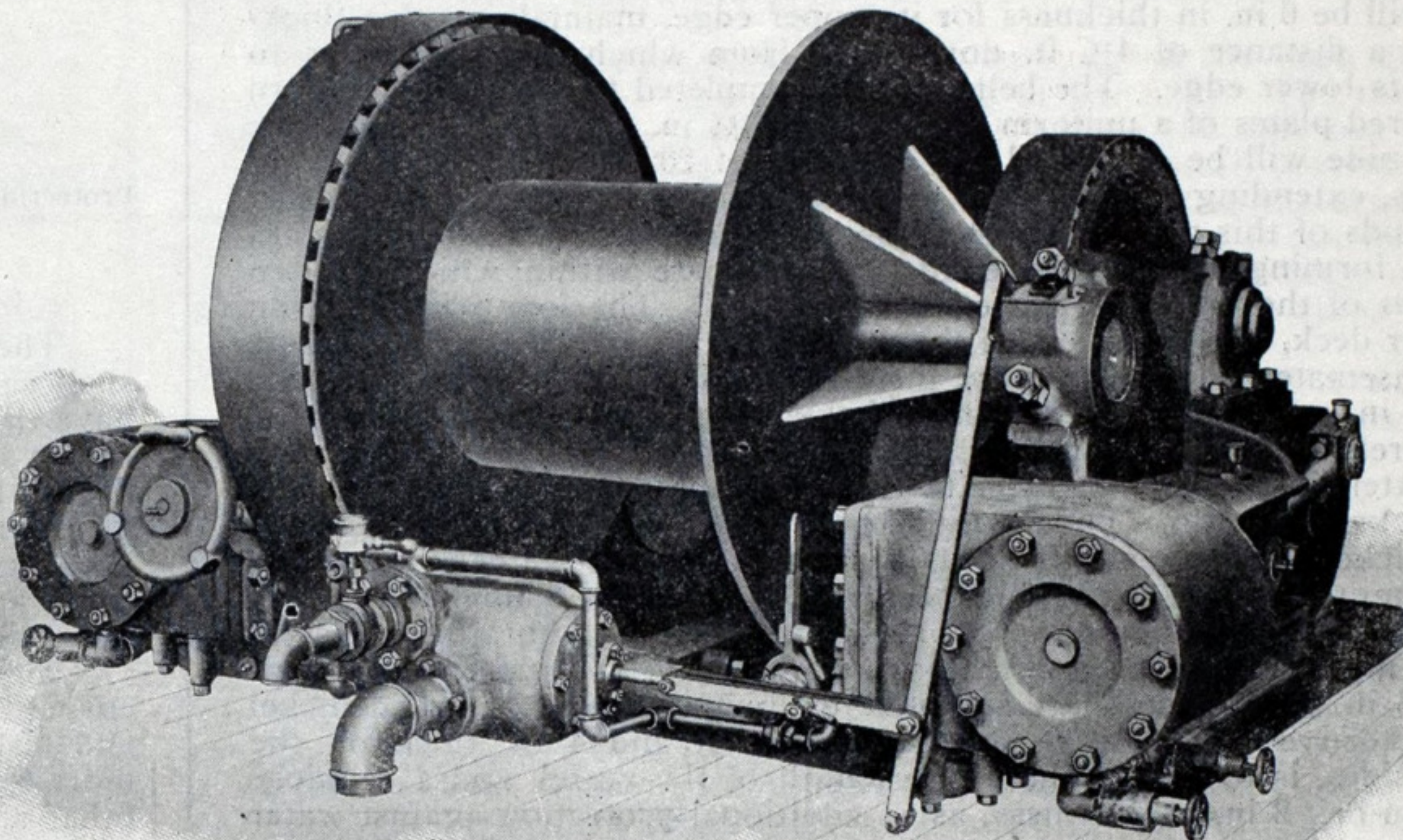


43 ft.; depth to shelter deck, molded, 50 ft.; draught, loaded, 27 ft. 4 in. The vessels will be equipped with four masts and two deck sockets with eighteen 50-ft. derricks for working cargo. There will be fittings for carrying 750 head of cattle on the main deck, which is practically water and weather proof. There will be ample accommodations on upper deck amidships for officers. The crews' quarters will be forward. The vessels will have nine large cargo hatches and will be equipped with eighteen steam winches. They will have a double water bottom of about 3,500 tons capacity, a tonnage displacement of 18,000 tons, cubic tonnage of 13,500 tons and a dead weight carrying capacity of 11,000 tons. These vessels will be equipped with twin-screw triple expansion engines designed to drive them at a speed of over 14 knots on a total horse power of 6,000.

Chase Type of Towing Machine.

The Chase Machine Co., engineers and machinists, of Cleveland, have for years been known to the ship owners of the great lakes as successful builders of deck engines and other machinery used aboard vessels. This company has just issued a catalogue that contains illustrations of an automatic towing machine, which they have lately introduced, to be used on large towing vessels with wire tow lines. Two views of the machine will be found on this page. The manufacturers say of this machine:

"The double gearing makes the machine extremely strong, compact and powerful. The steam cylinders are of correspondingly less diameter, and lagged with asbestos, and present very small area for condensation. The steam passages are ample, and the machine handles the tow line quickly and easily, being able to haul the barge up to the steamer while



the latter is going ahead at full speed. The automatic gearing is simple, easily understood, and positive in its action, and is readily disconnected by throwing a handle. These machines are made in two sizes, and sold at reasonable prices. Every detail is carefully worked out, and the workmanship and material are of the best. When conditions of service are clearly explained to us in advance, we absolutely guarantee satisfaction in every particular. We invite correspondence, whether or not with view to immediate purchase, and will be pleased to furnish plans and other information on application."

Bids for the Protected Cruisers.

Only four ship building firms competed for the three protected cruisers, St. Louis, Milwaukee and Charleston, bids for which were opened last Friday. Secretary Long, who presided, asked the ship builders present if they all understood that certain articles of equipment had been stricken from the specifications, thus reducing the cost of construction to the contractors. He went on to explain that articles of construction to be furnished by the government were to be laid down in the ship yards of the contractors and that the cost of the armor, to be deducted from the appropriation, had been reduced from \$100,000 to \$50,000. The limit of cost fixed by congress for each vessel was \$2,800,000, and with \$50,000 deducted for armor the limit cost to the contractor was \$2,750,000. Three of the four bidders submitted proposals within the limit of \$2,750,000. They were: Newport News Ship Building & Dry Dock Co. of Newport News, Va., class 2 (builders' plans), one vessel within thirty-six months at \$2,741,000; Bath Iron Works of Bath, Me., class 2, one vessel within thirty-six months at \$2,750,000; Neafie & Levy of Philadelphia, one vessel (department plans) at \$2,740,000. The bids of the Newport News and Bath concerns were straight, containing no reservations. Neafie & Levy's bid, while the lowest of the three, provided for the elimination of certain equipment work and that linoleum and cellulose should be furnished by the government. The William R. Trigg Co. of Richmond, Va., did not submit a formal bid, but offered to build one vessel for \$2,780,000 or two vessels of \$5,480,000, being \$2,740,000 each, a figure within the limit of cost set by congress.

There is no doubt that the Newport News company, the Bath Iron Works and Neafie & Levy will each get a contract for building one cruiser.

Navy Yard at Charleston.

Secretary Long concurs in the recommendation of the naval board regarding the transfer of the South Atlantic naval station from Port Royal to Charleston, S. C., and arrangements will now proceed for the purchase of the site at Charleston and the carrying out of the transfer. Already there is available \$227,000 for the general purpose of the station and of this not to exceed \$100,000 can be used in the purchase of the site. The final step will be to direct Admiral Endicott, chief of the bureau of yards and docks, to arrange for the site in accordance with the recommendations. There is a question whether the purchase price of the site selected can be brought within the \$100,000. That portion within the Charleston park, called Chicora park, can be had at the government price, but the private land adjoining is held at \$90,000 and the naval board recommends a price which will aggregate about \$34,000. In case this cannot be bought at a reasonable figure, the government will resort to condemnation proceedings.

Evolution of a Nautical College.

The first navigation school in New York city was established in 1821 by E. C. Ward, a former officer in the United States navy, and was situated at 202 Water street, corner of Fulton. For a number of years this school was successfully conducted by its founder, and upon his retirement it was carried on by a former assistant of Mr. Ward's. Capt. William Thoms, a celebrated ship master in his day, and the author of Thom's "Practical Navigator," took up the teaching of navigation in 1852. After his death the institution was perpetuated in turn by his wife, daughter and son, until ex-Lieut. John Malcom, U. S. N., who died several years ago, built his well-known school upon the old foundations.

In 1882 Lieut. Malcom gave up his school, and Capt. Howard Patterson, a former naval officer, an author of several works on nautical science, and a commander of vessels out of New York, assumed the management and changed the name of the institution to the New York Nautical College. New quarters were obtained, large class and lecture rooms elaborately fitted up, and a new era of prosperity was commenced. The history of the college since that time has been one of constantly growing importance and magnitude. In its present quarters it occupies nearly the

entire four-story double building, 130 and 132 Water street. Departments in navigation, seamanship, marine engineering and naval science are exhaustively appointed with many thousands of dollars worth of models, instruments, engines and appliances of every nautical character calculated to be of assistance in the instruction of nautical matters appertaining to any one of the various branches. All these departments and class rooms are presided over by competent instructors, who direct their work along the lines laid down by Capt. Howard Patterson, the president of the college. Another new feature to be at once introduced is that of a cruising school ship to be used during the summer months for the practical education of yachtsmen.

Preparations are being made to incorporate the college under the Regents laws of the state of New York, and thus an increased dignity will be experienced by this most worthy institution, which is the nautical alma mater of some of our most celebrated merchant officers, as well as of many men who hold responsible positions in the coast survey, transport and light-house service; and to this may be added hundreds of names of American yachtsmen graduates who are not only distinguished in this country, but who possess international reputations as true and bonafide Corinthian seamen and navigators.

U. S. Engineer Office, St. Augustine, Fla., Jan. 26, 1901. Sealed proposals for building and equipping a steel hull, stern wheel, combined dredge and snagboat will be received here until 12 noon, Mar. 7, 1901, and then publicly opened. Information furnished on application. C. H. McKinstry, Capt., Engrs. Feb. 21.

U. S. Engineer Office, 1637 Indiana Ave., Chicago, Ill., February 4, 1901. Sealed proposals for dredging in Chicago Harbor will be received until 12 noon, central time, March 12, 1901, and then publicly opened. Information furnished on application. J. H. Willard, Maj., Engrs. Feb. 28.

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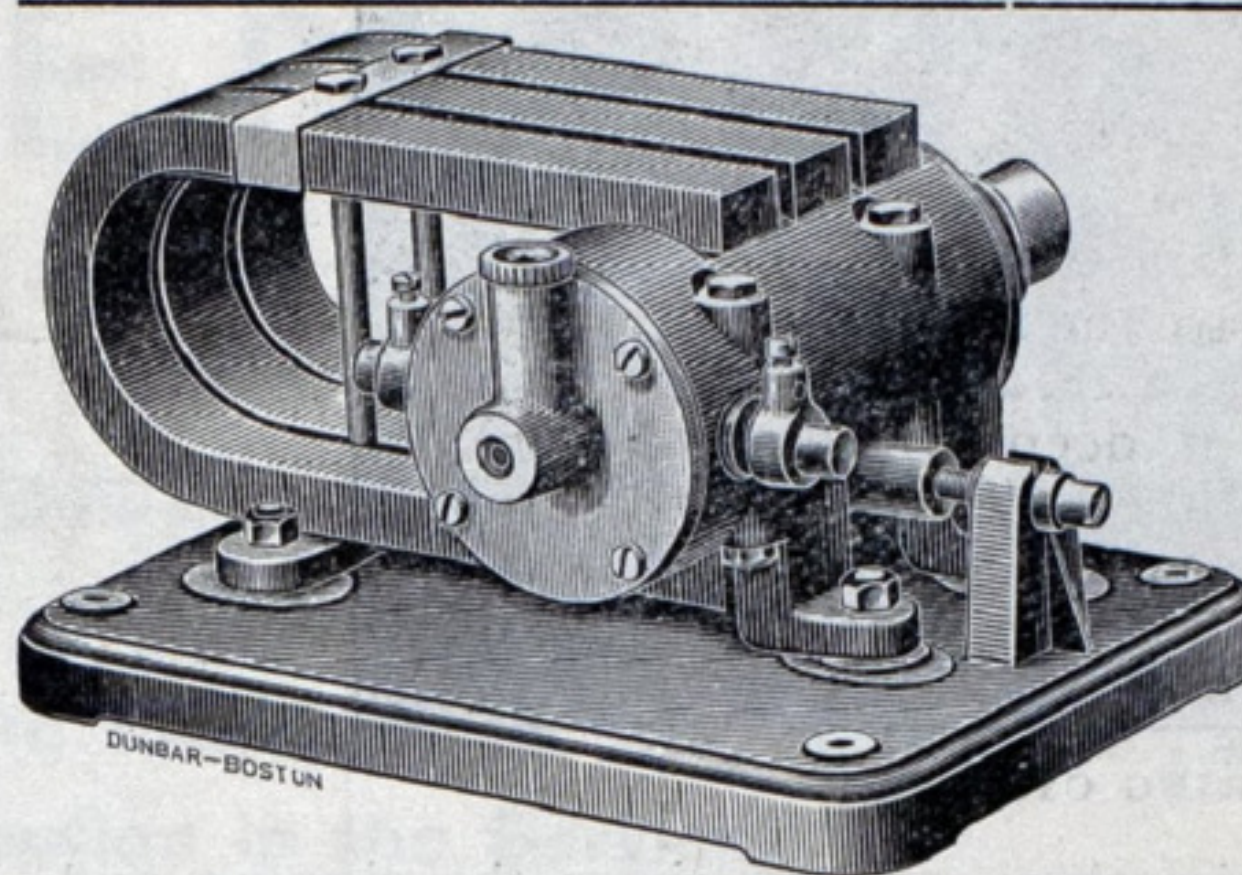
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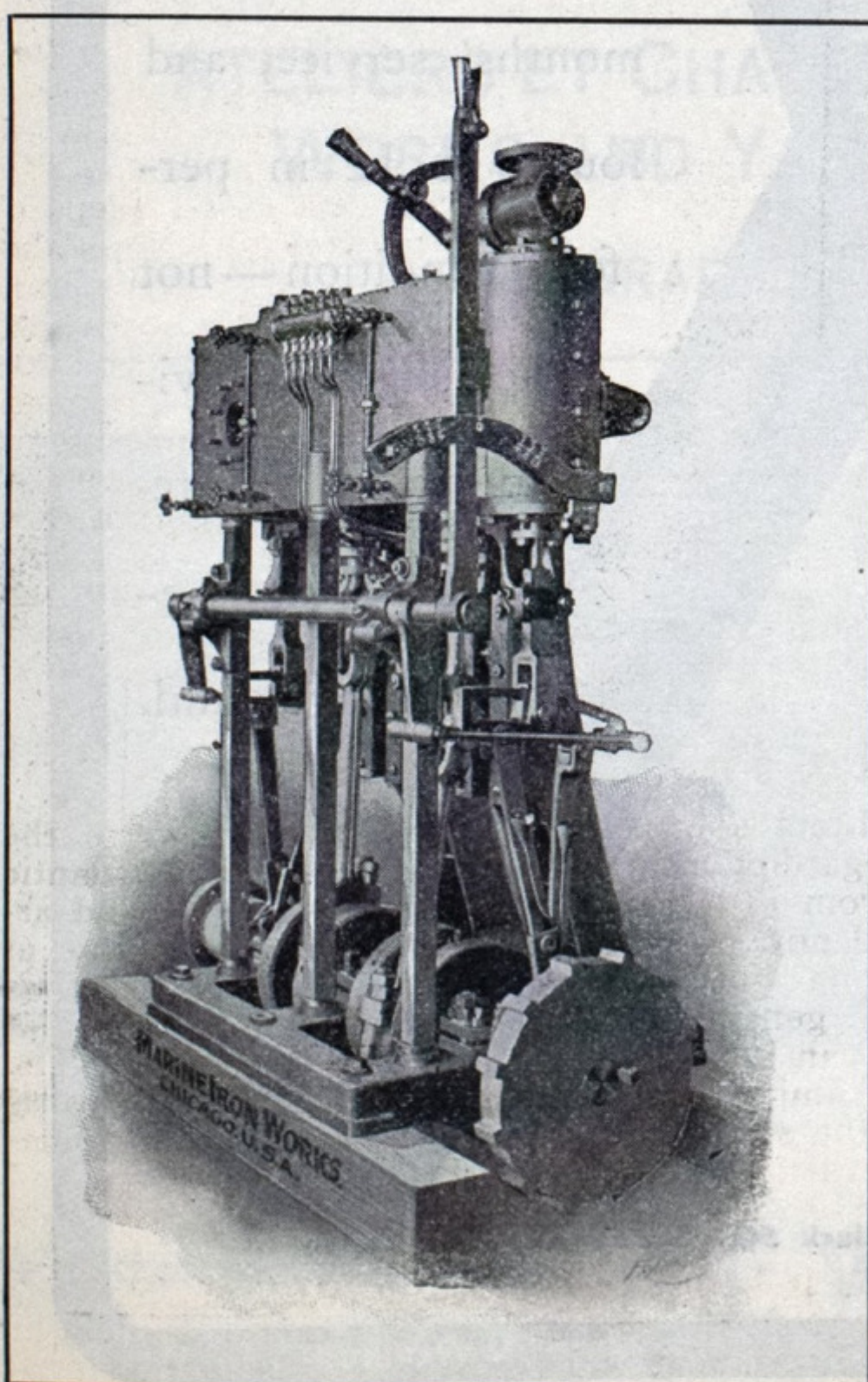
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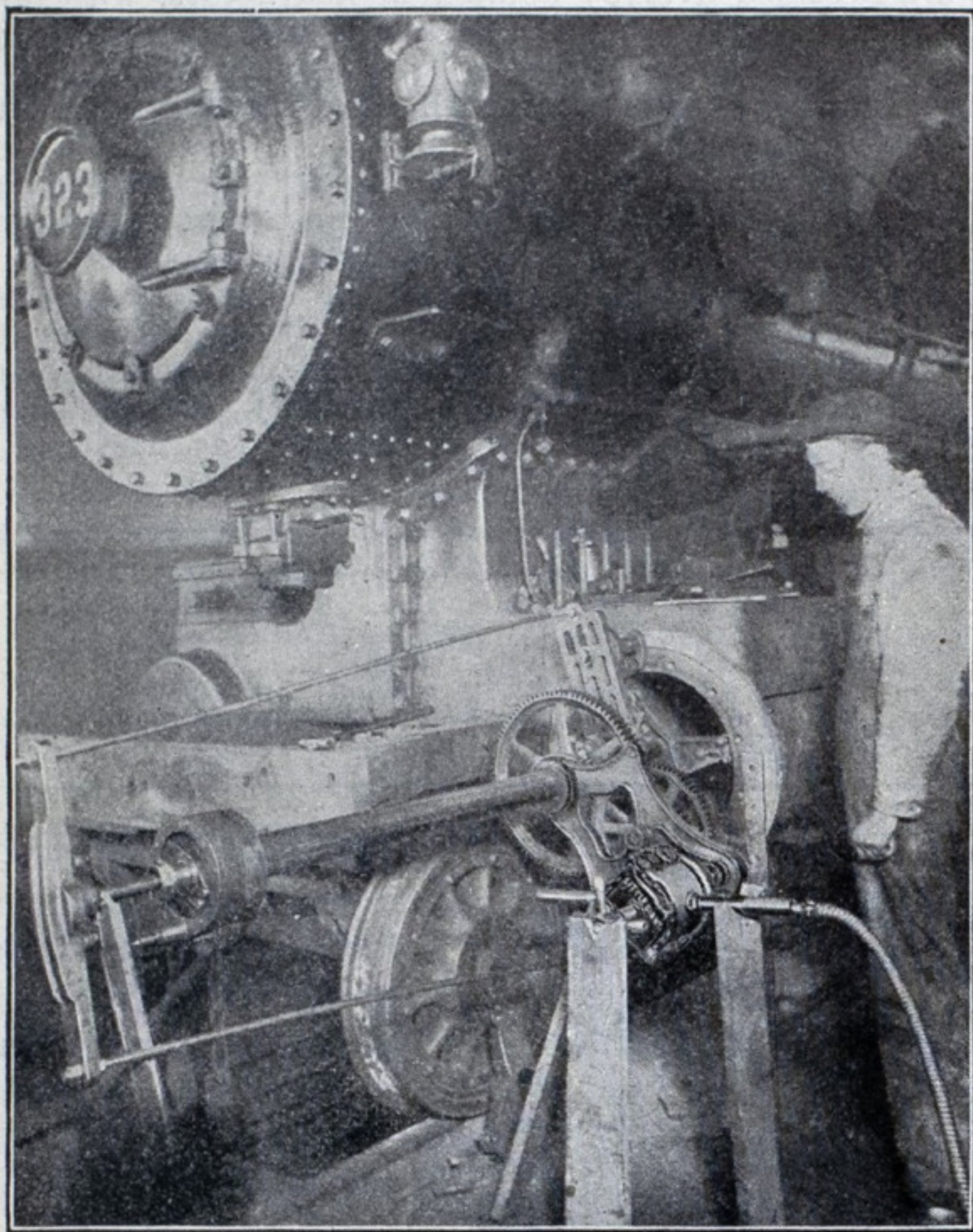
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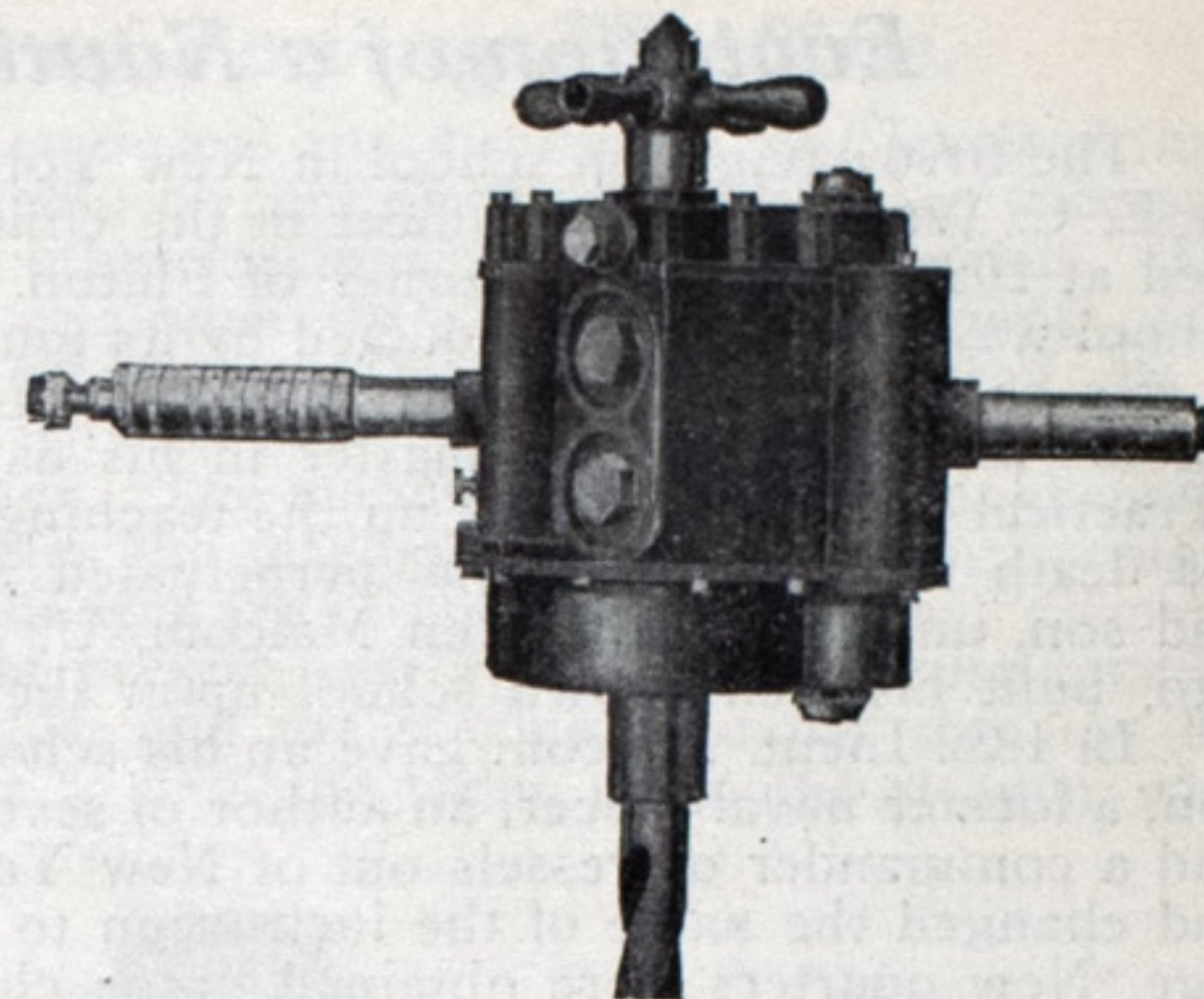
We show herewith a view of the Little Giant high speed motor No. 0, rigged for boring out the cylinder of a locomotive. This drill is especially valuable about a shop for all purposes for which a flexible spindle drill is commonly used and also for many purposes in the erecting shop for



NO. 0 BORING CYLINDER.

which any other tool would require three or four times the rigging and expense. It develops $3\frac{1}{2}$ H.P. with 90 lbs. air pressure and is very economical, as it is not a rotary, but a piston motor and cuts off at five-eighths stroke, using the air expansively like a steam engine. It is made

entirely of steel and will drill up to 3 in. diameter. Its weight is only 50 lbs. and the drill spindle is fitted for Morse socket. These machines are made in various sizes and their use is steadily growing on account of their economy and convenience. For drilling, reaming and tapping in position they are economical and deservedly popular. The Standard Pneumatic Tool Co., Marquette building, Chicago, issue a special catalogue E, fully describing these drills, and it should be in the hands of every foreman and master mechanic; sent on application.



Items of General Interest.

Masters and engineers of the Union Transit Co.'s steamer line, Buffalo, have been reappointed for the season of 1901 as follows: Avon, Capt. Norman McGuire, Engineer Joseph Jamieson; Portage, Capt. John Tierney, Engineer George Haig; John M. Nicol, Capt. William McLeane, Engineer George Threthaway; Eber Ward, Capt. John McIntosh, Engineer James Countryman; W. H. Stevens, Capt. Alexander Clark, Engineer John McSweeney; James Fisk, Capt. John Pearson, Engineer Joseph Buford.

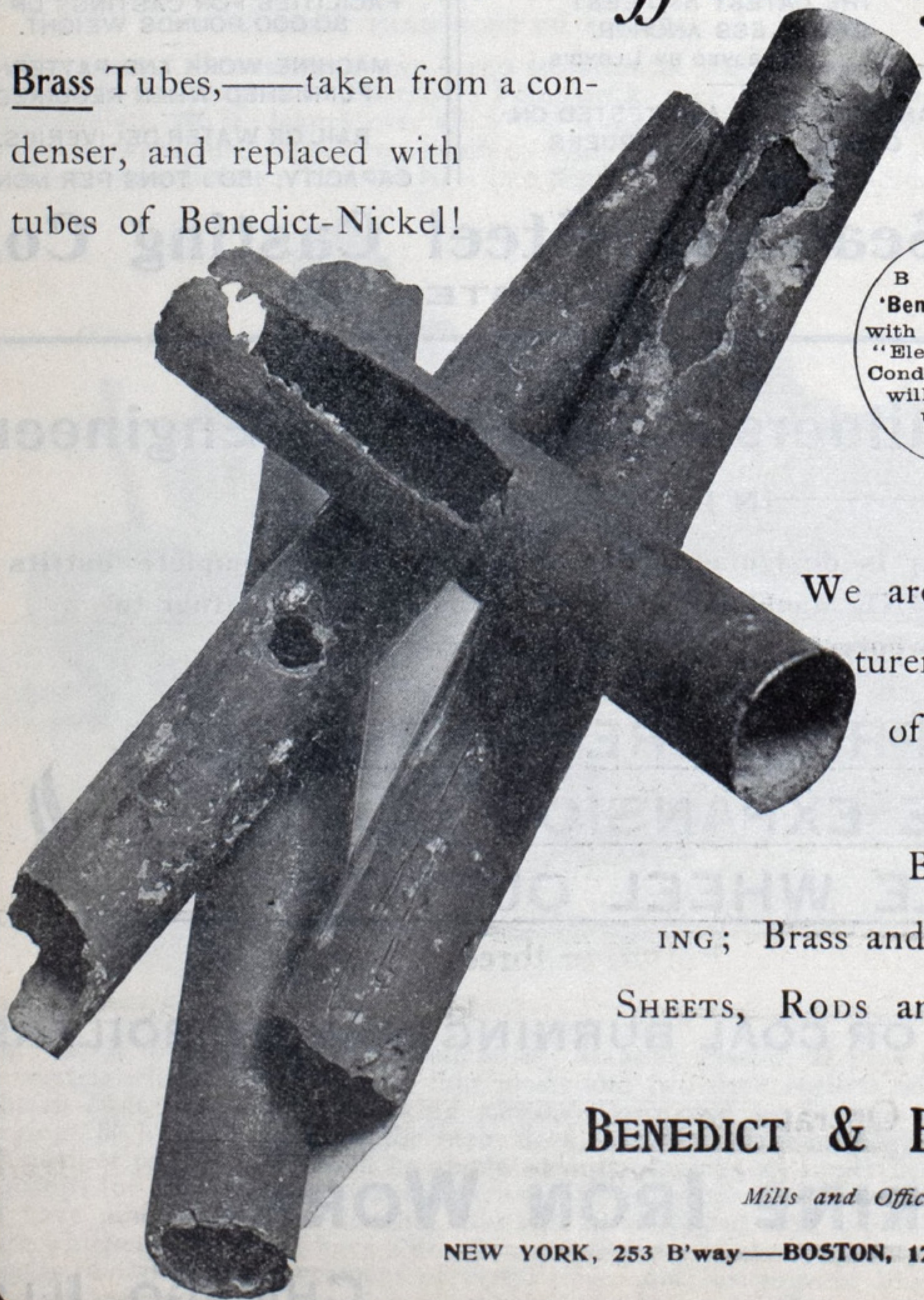
The American Bridge Co. has a contract for furnishing the steel work to the navy bureau of yards and docks for building No. 22 at the New York navy yard. This company has also closed a contract with the crown agents for the colonies of Great Britain to furnish and erect on the line of the Uganda railway in Africa twenty-seven viaducts. This will require about 6,000 tons of steel work. These viaducts consist of plate girder spans on towers. The highest tower will be 112 ft. Sir A. M. Rendel & Co. of London are the engineers for the crown agents.

A matter of importance accomplished at the annual meeting of the Shipmasters' Association of the Great Lakes at Port Huron last week was the adoption of the fifty-year age limit. The following officers were elected: Capt. C. H. Hubbard of Chicago, president; Capt. George W. Pierce of Port Huron, vice president; Edward G. Ashley of Toledo, secretary; W. A. Collier of Cleveland, treasurer.

Capt. J. J. H. Brown of Brown & Co., Buffalo, has gone to California. He will spend about six weeks on the Pacific coast.

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Brass Tubes,—taken from a condenser, and replaced with tubes of Benedict-Nickel!



A booklet on "Benedict-Nickel," with a treatise on "Electrolysis of Condenser Tubes," will be mailed upon request.

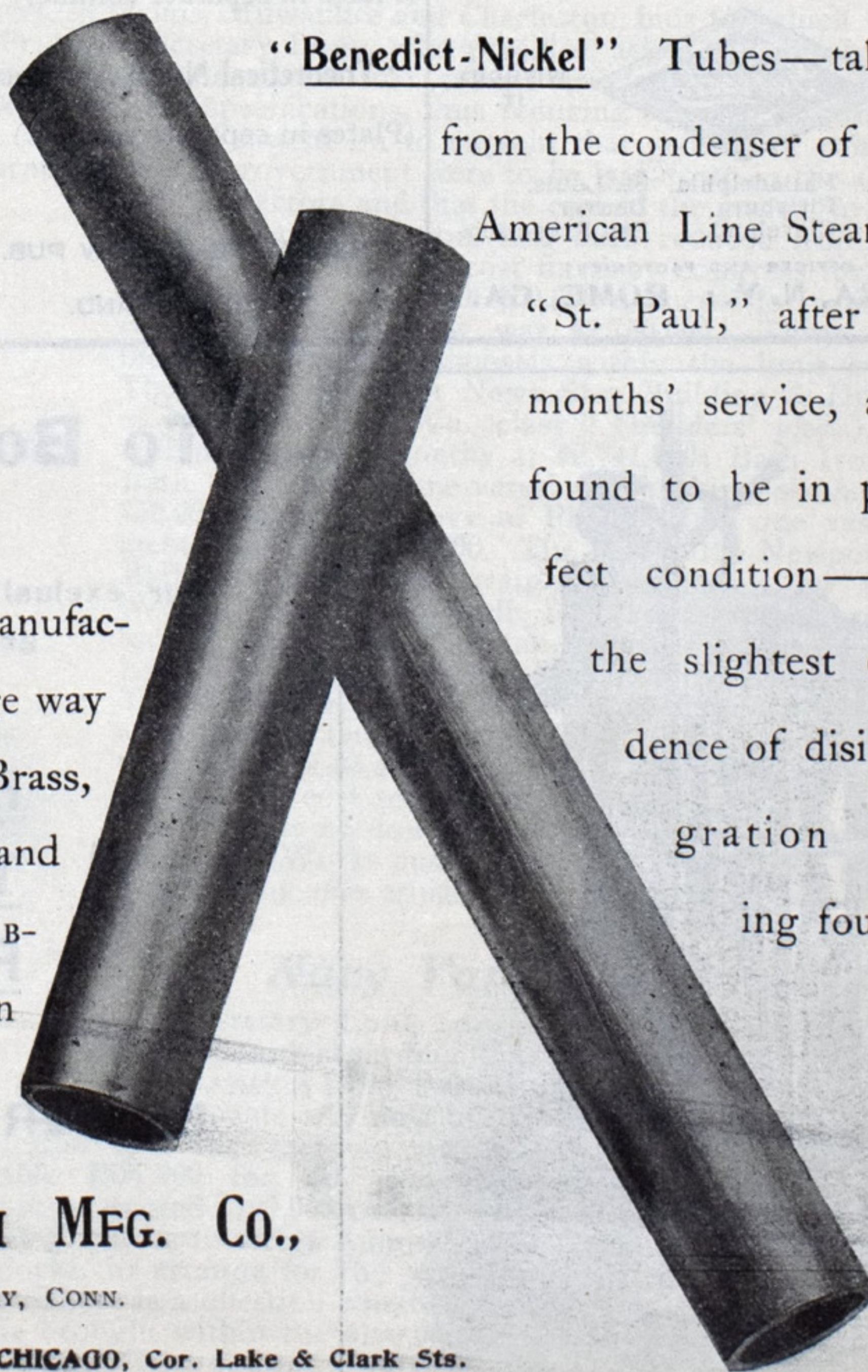
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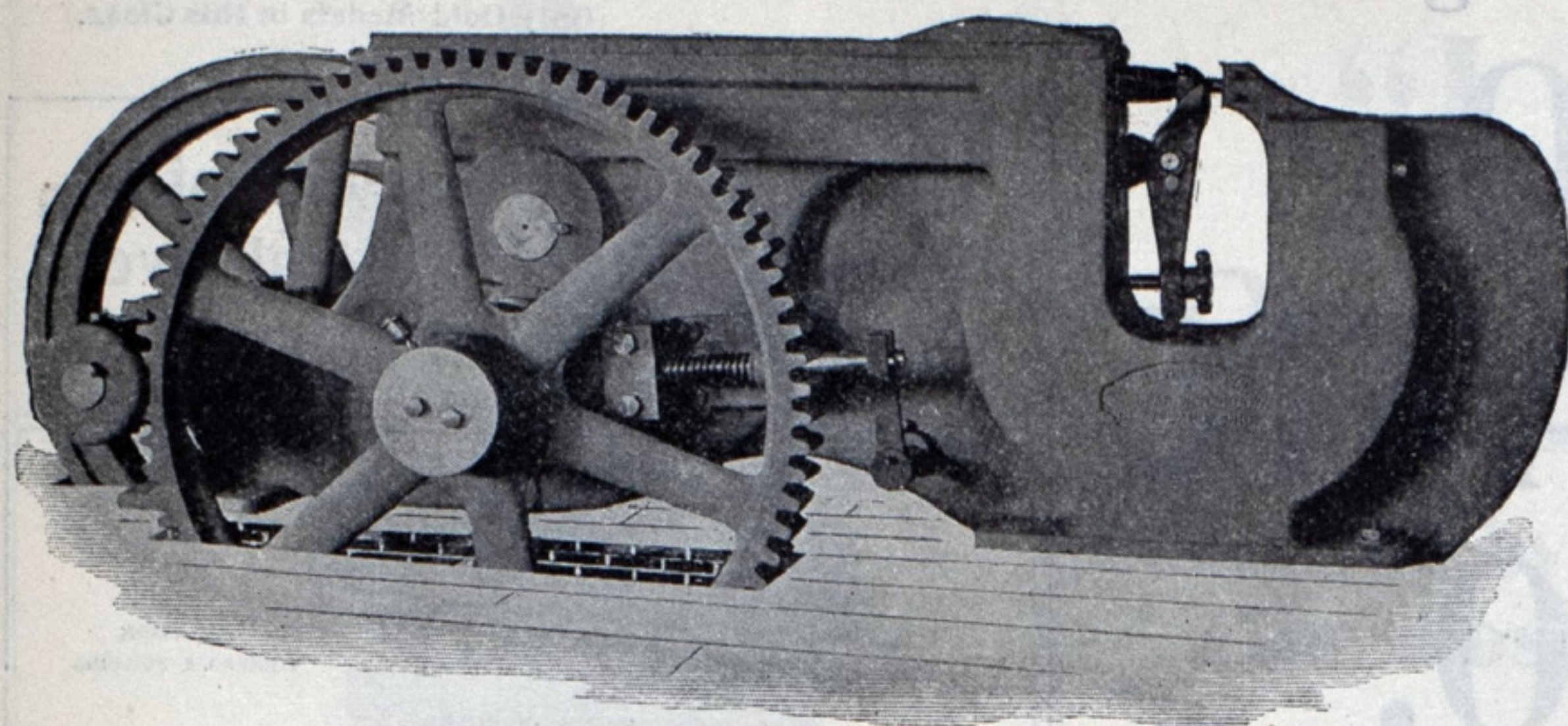
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"Benedict-Nickel" Tubes—taken from the condenser of the American Line Steamer "St. Paul," after 28 months' service, and found to be in perfect condition—not the slightest evidence of disintegration being found.



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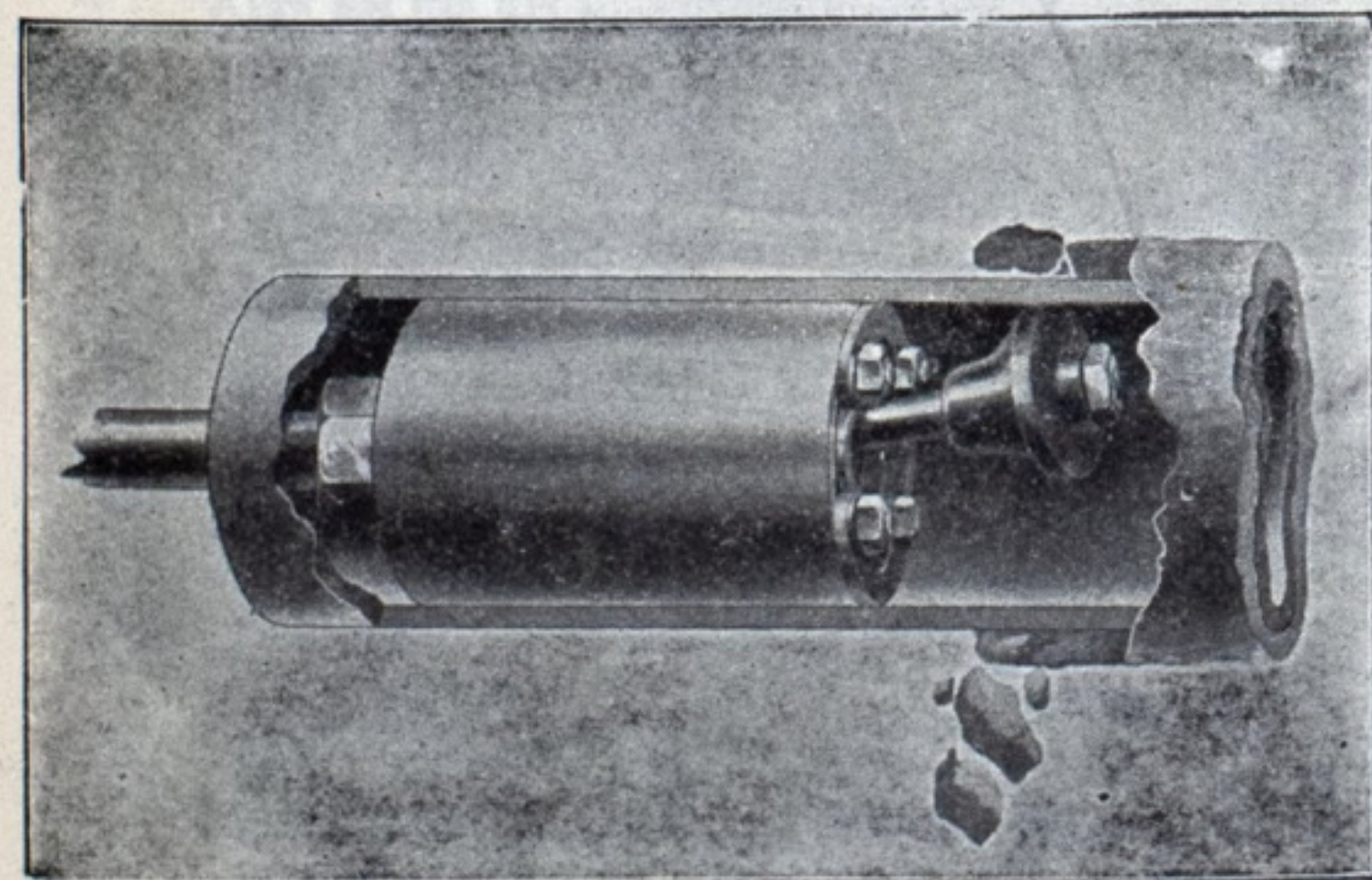
Number of Marine Leagues made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australian	Polynesian	Armand Behic	Ville de la Ciotat	Ernest Simons	Chili	Cordillere	Laos	Indus	Tonkin	Annam
1890.....	22,576	820									
1891.....	22,749	22,777	68								
1892.....	22,749	22,801	23,274	7,753							
1893.....	22,793	22,781	22,762	22,749							
1894.....	22,813	22,789	22,858	22,813	12,567						
1895.....	22,891	22,922	22,913	22,936	13,629	9,571					
1896.....	23,178	30,906	23,232	23,183	20,735	21,051	13,572				
1897.....	22,750	23,202	30,912	23,185	20,745	25,370	21,119	14,382			
1898.....	23,646	23,178	23,184	23,199	20,842	21,080	21,080	20,851	21,318	7,569	
1899.....	23,178	23,205	22,477	30,135	20,082	20,926	20,956	17,448	18,285	14,669	7,628
Total.....	229,323	215,381	191,680	175,953	108,600	97,998	76,727	52,681	39,603	22,238	7,628

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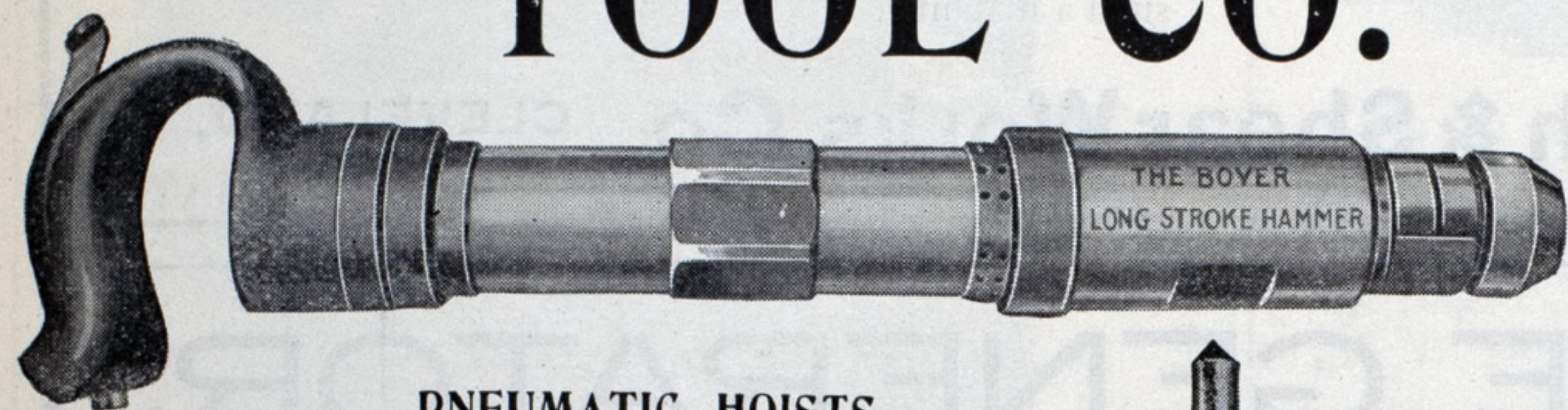
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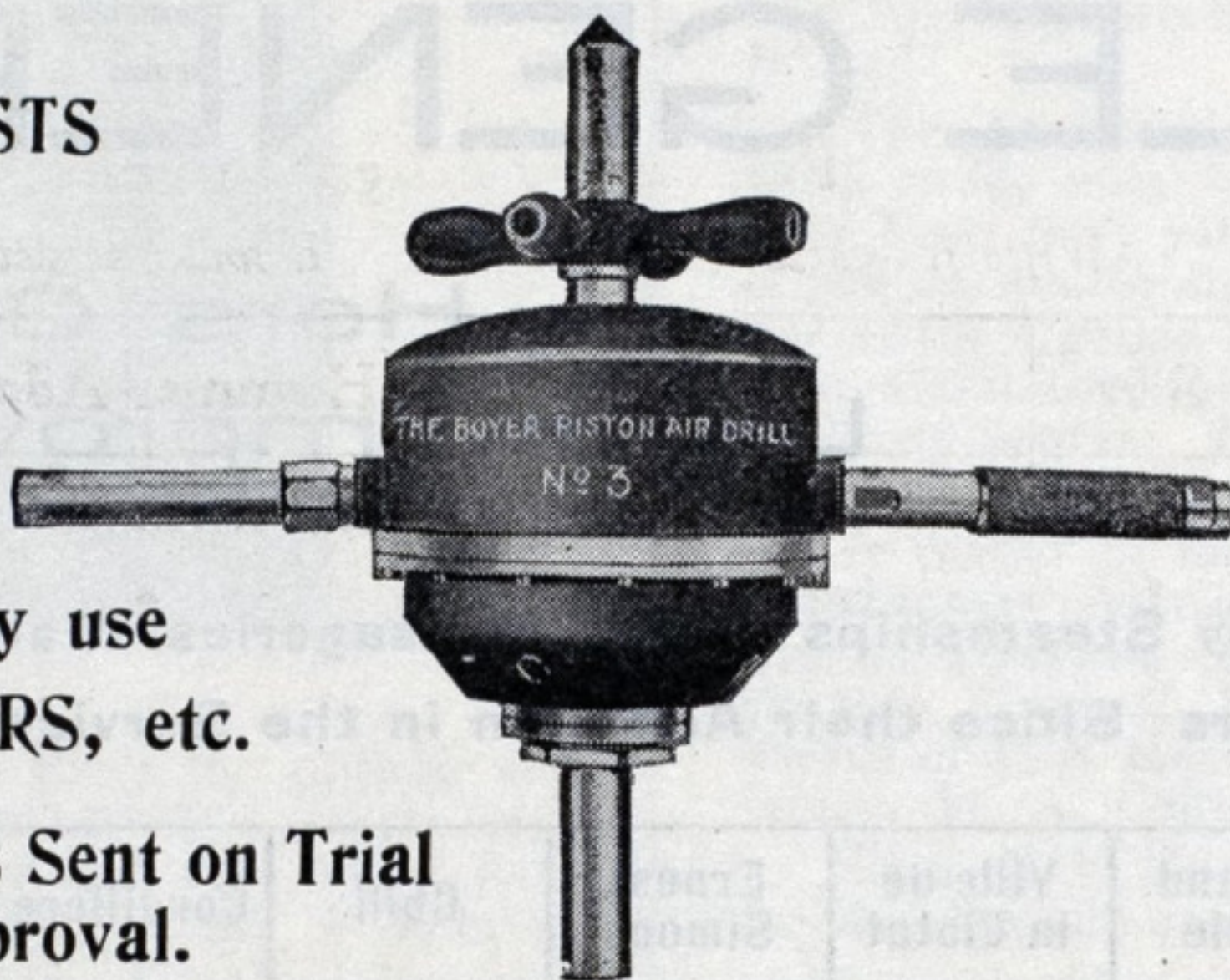
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Gold medal. Also that Mr. Boyer was awarded
a Gold Medal as collaborator and inventor of
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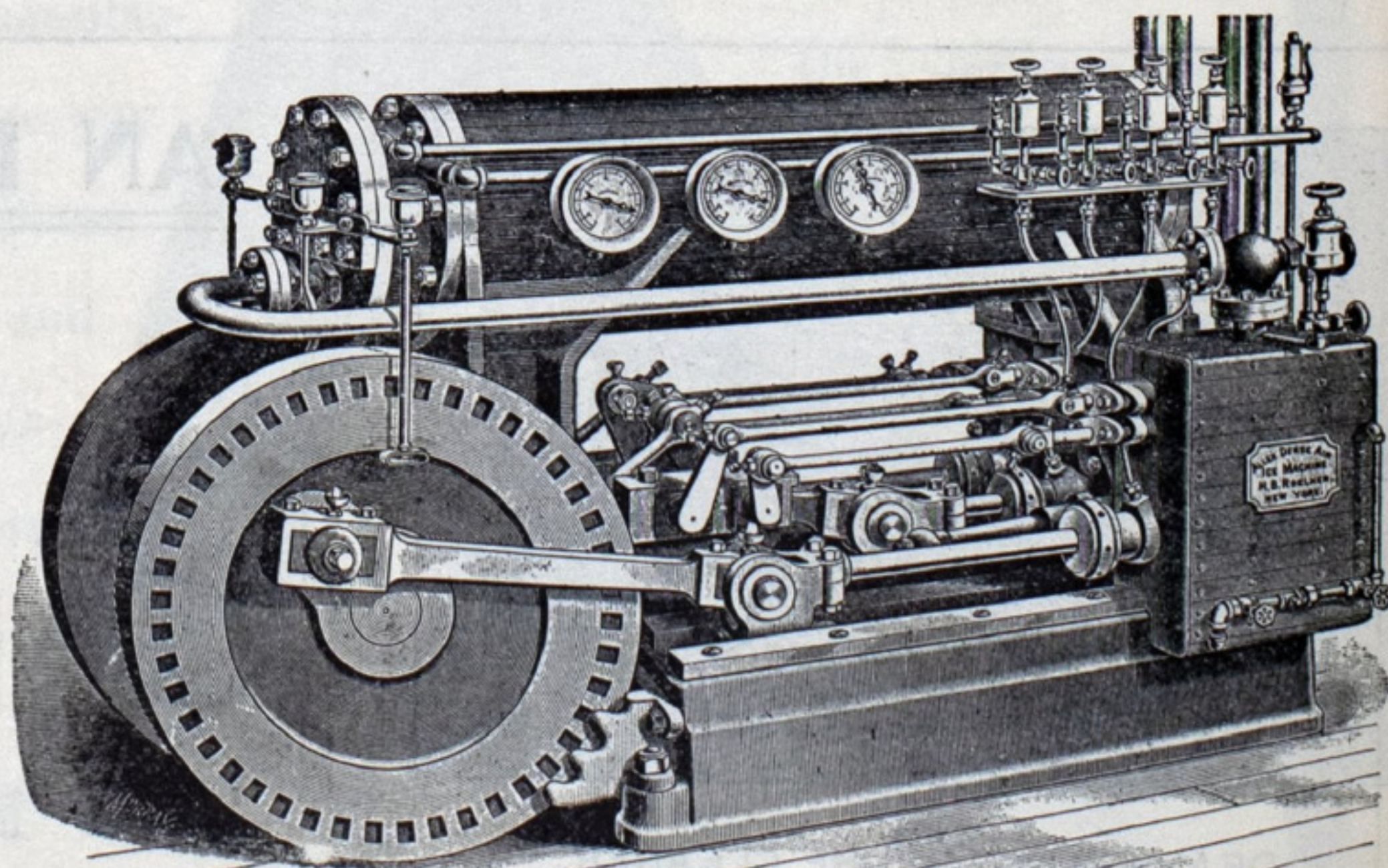
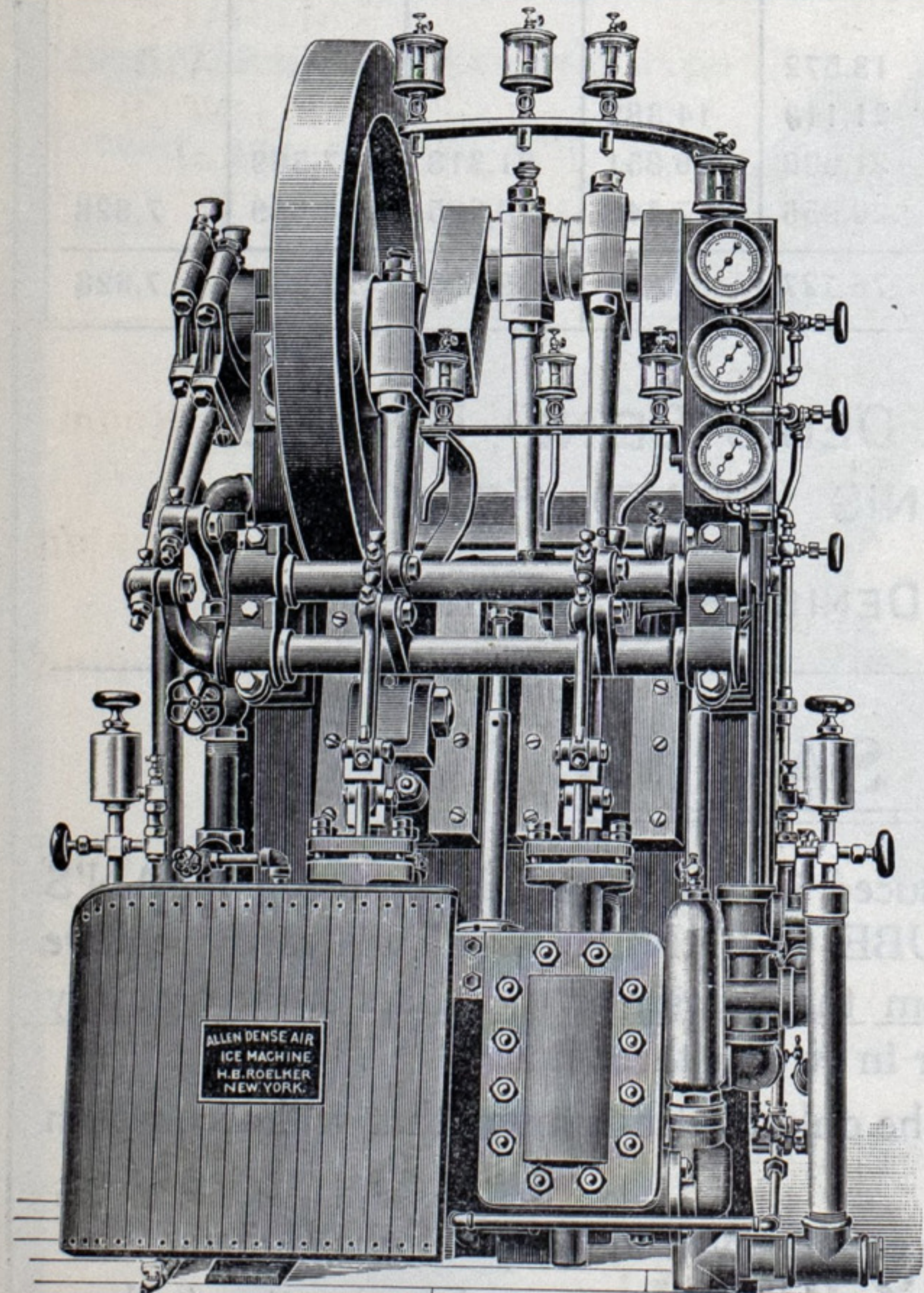
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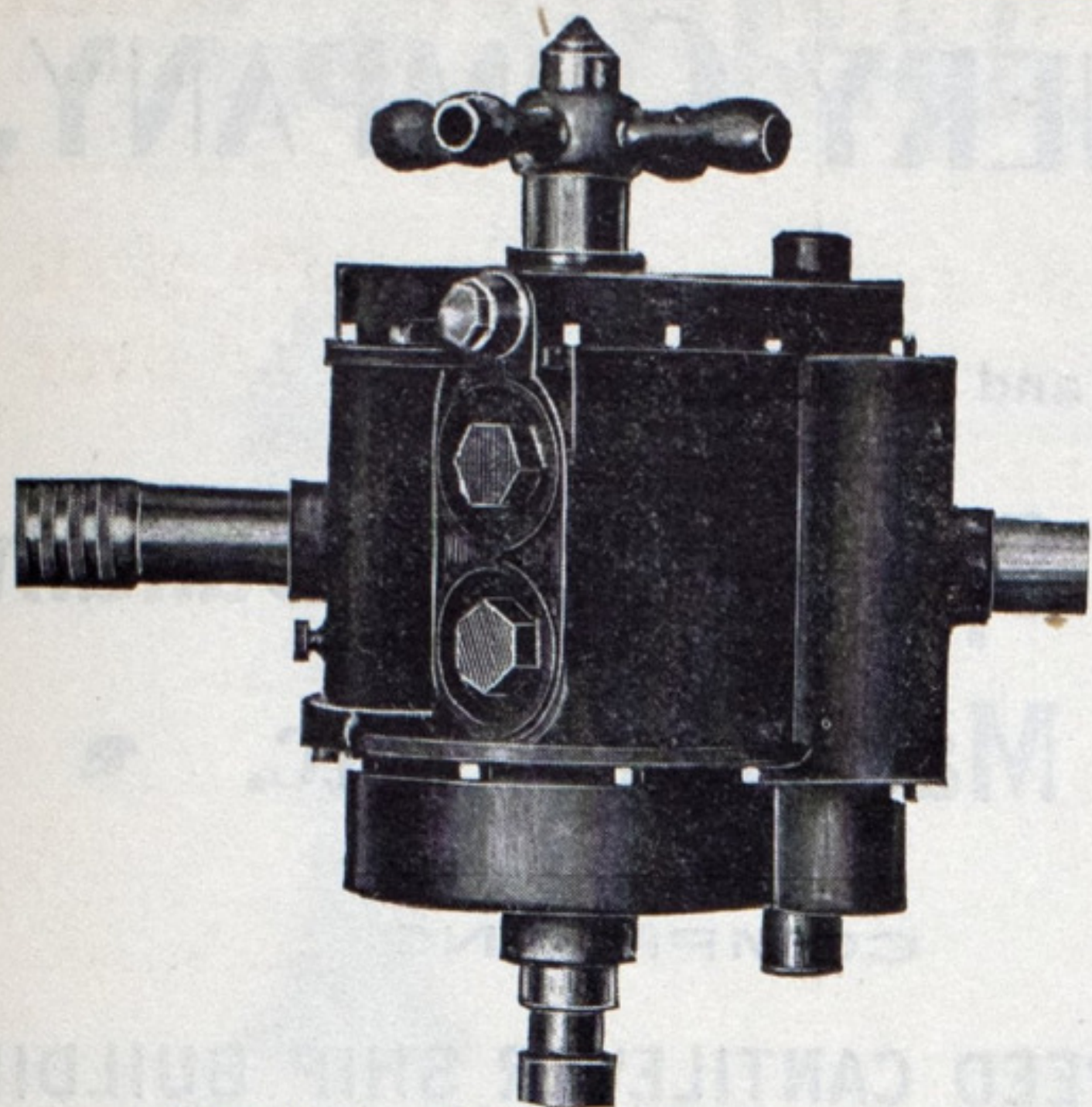
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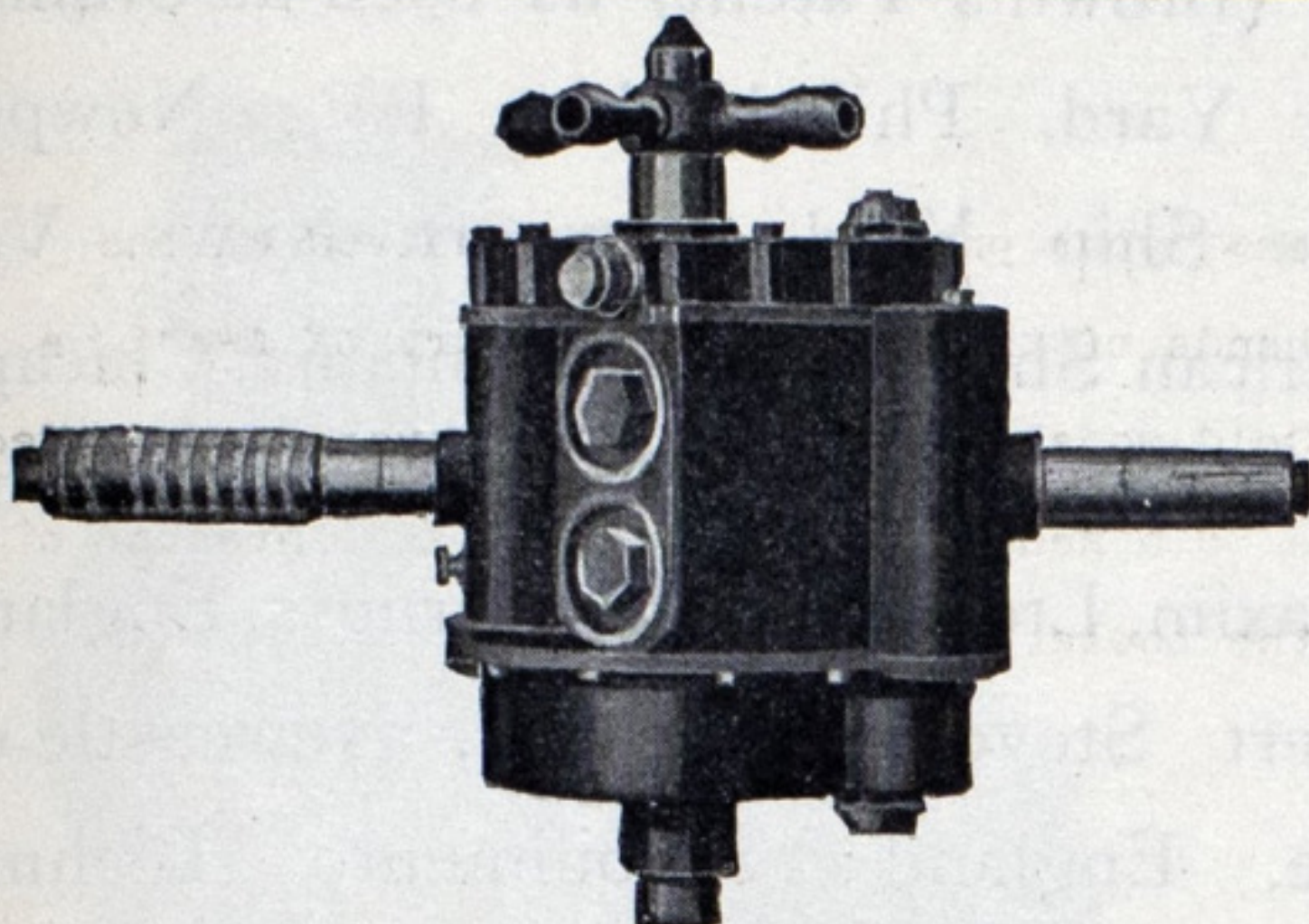
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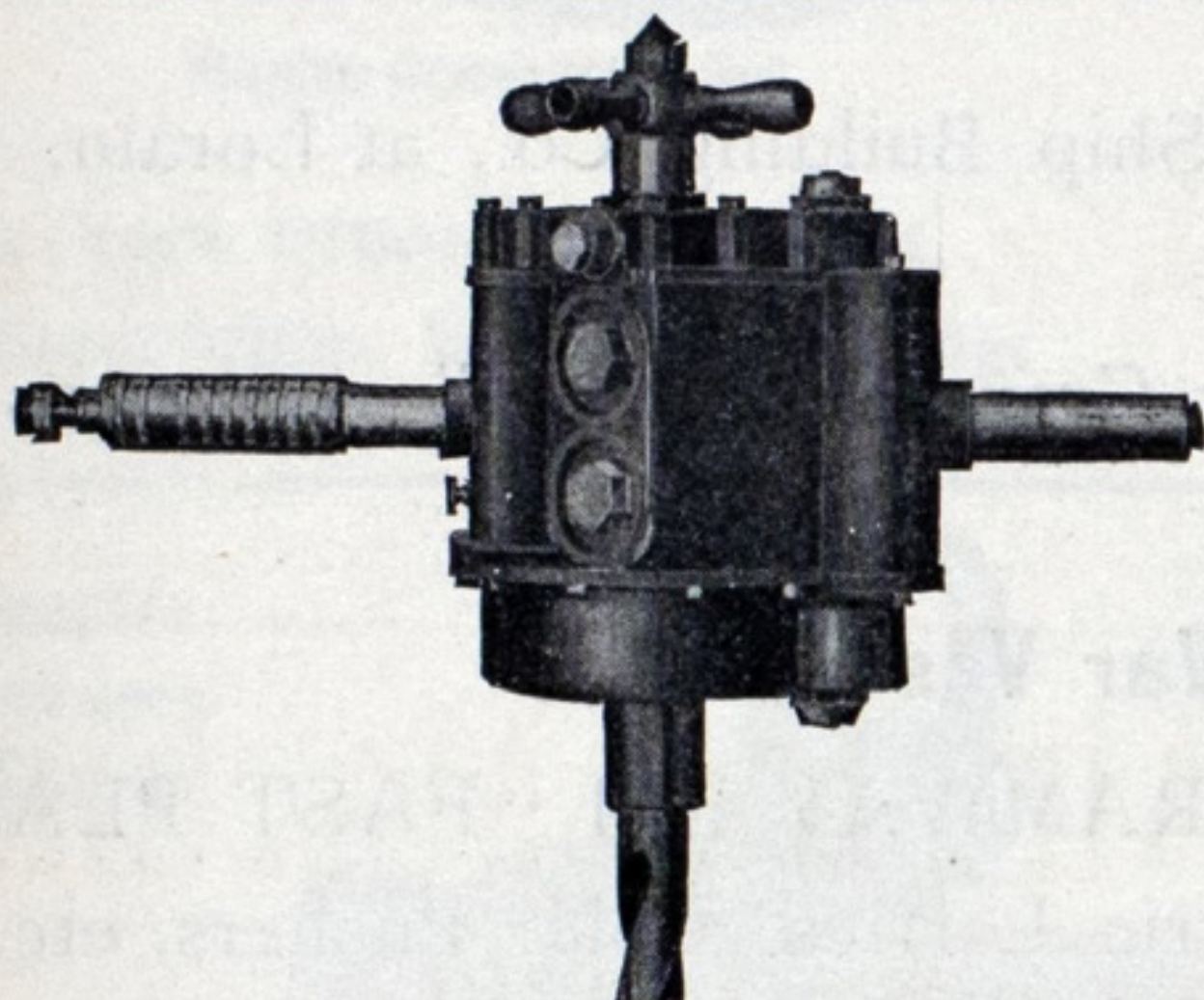
SCREW PROPELLERS.



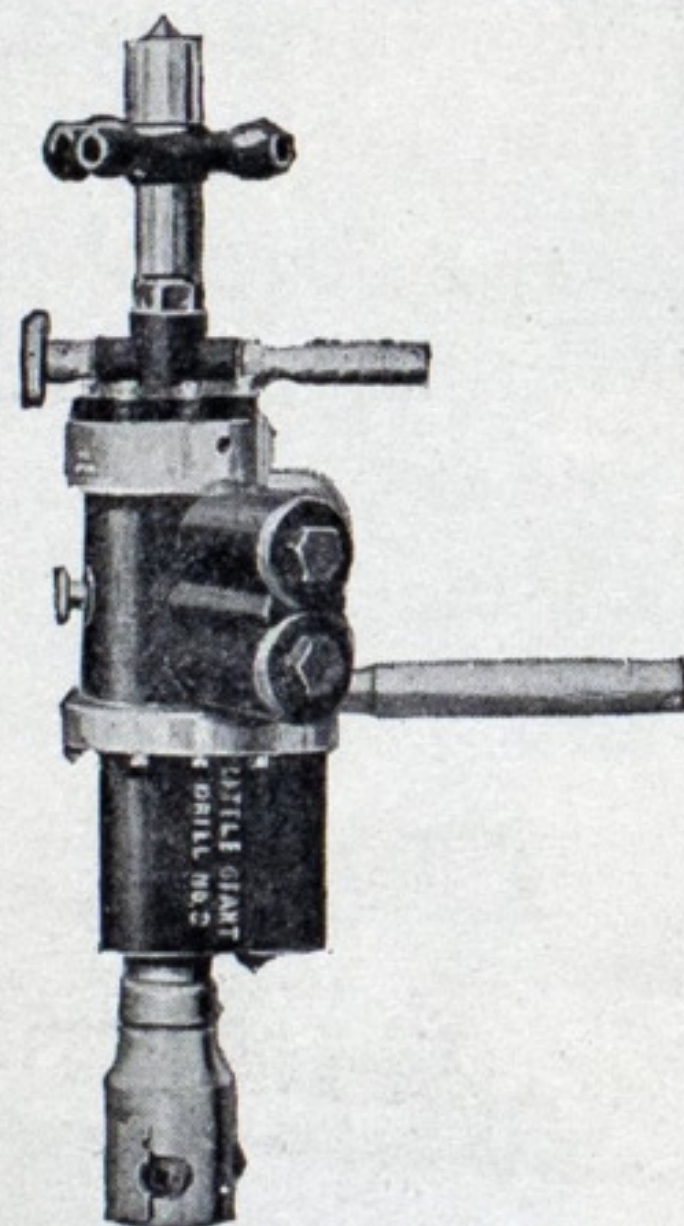
"LITTLE GIANT" DRILL No. 0.



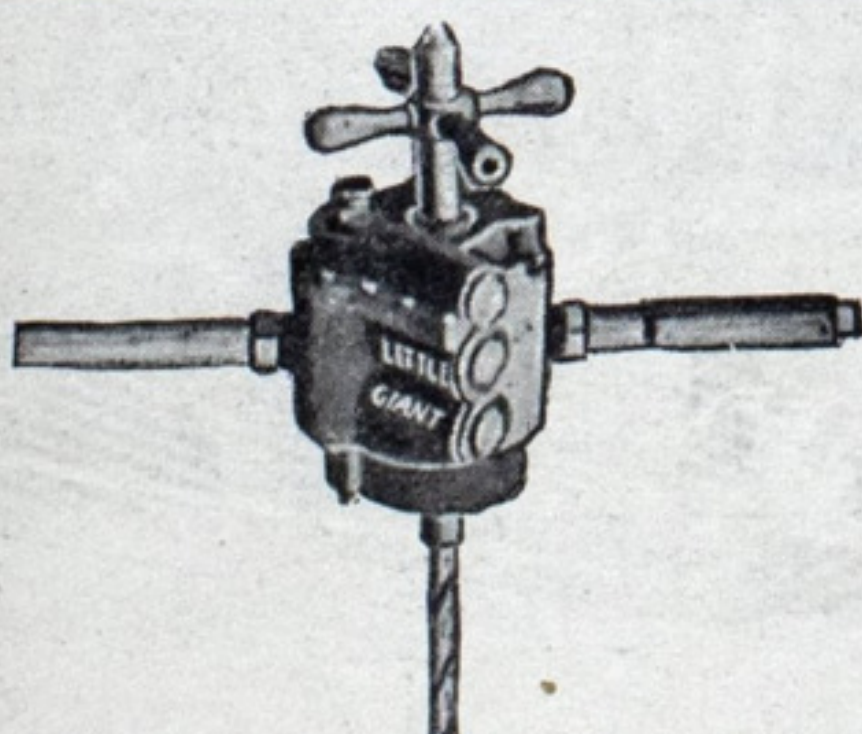
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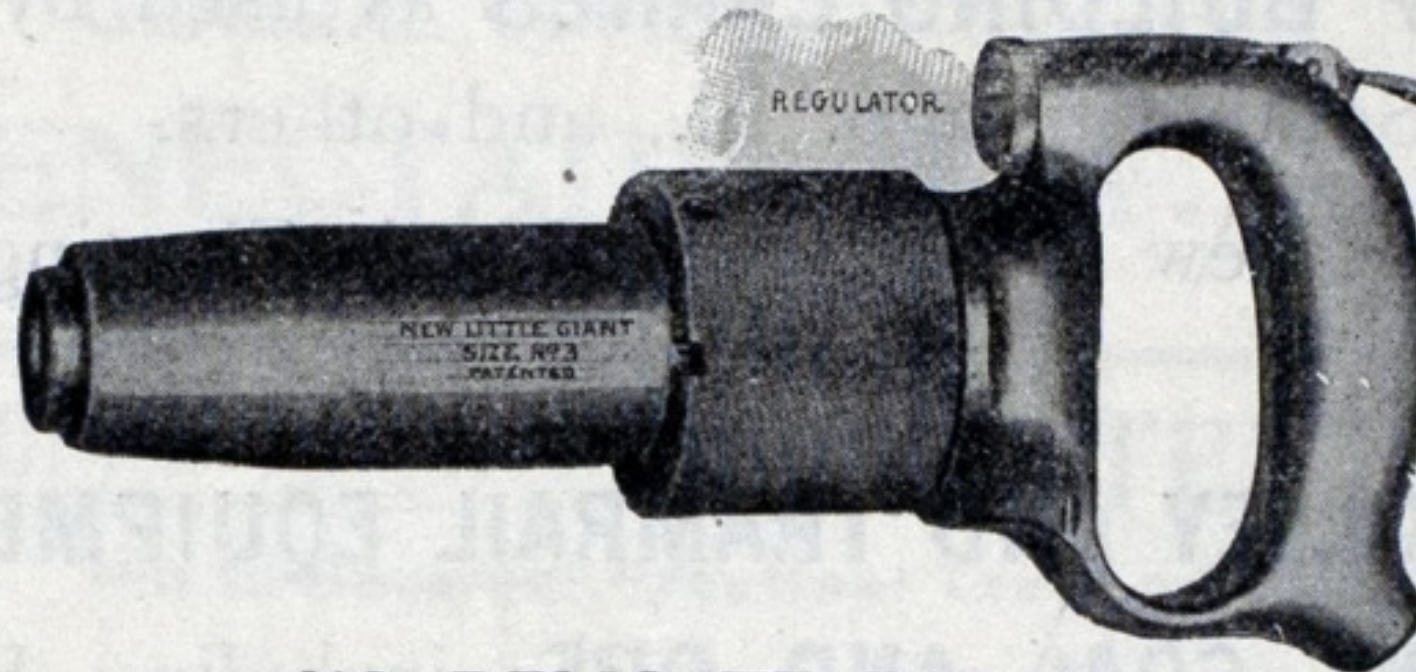
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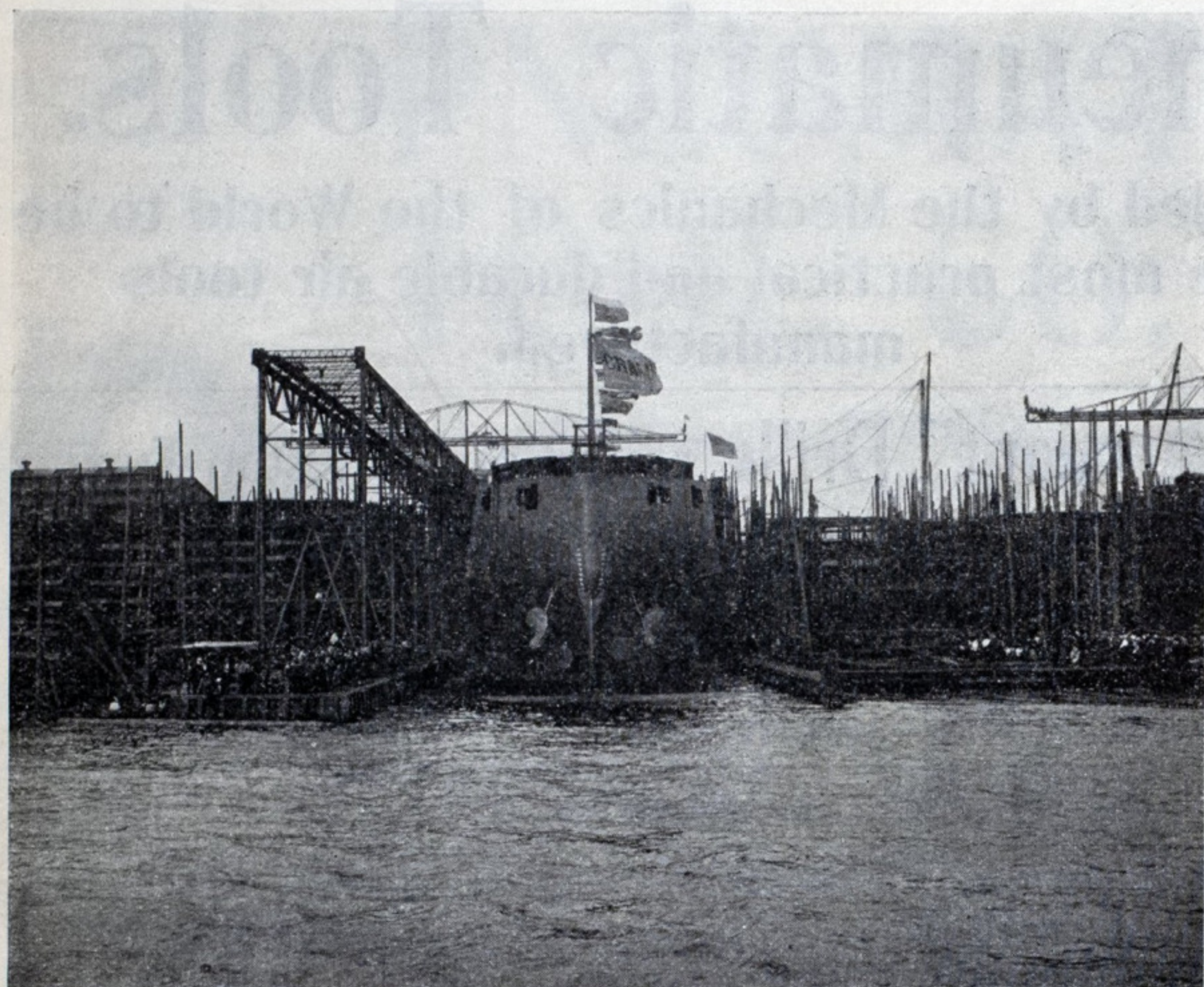


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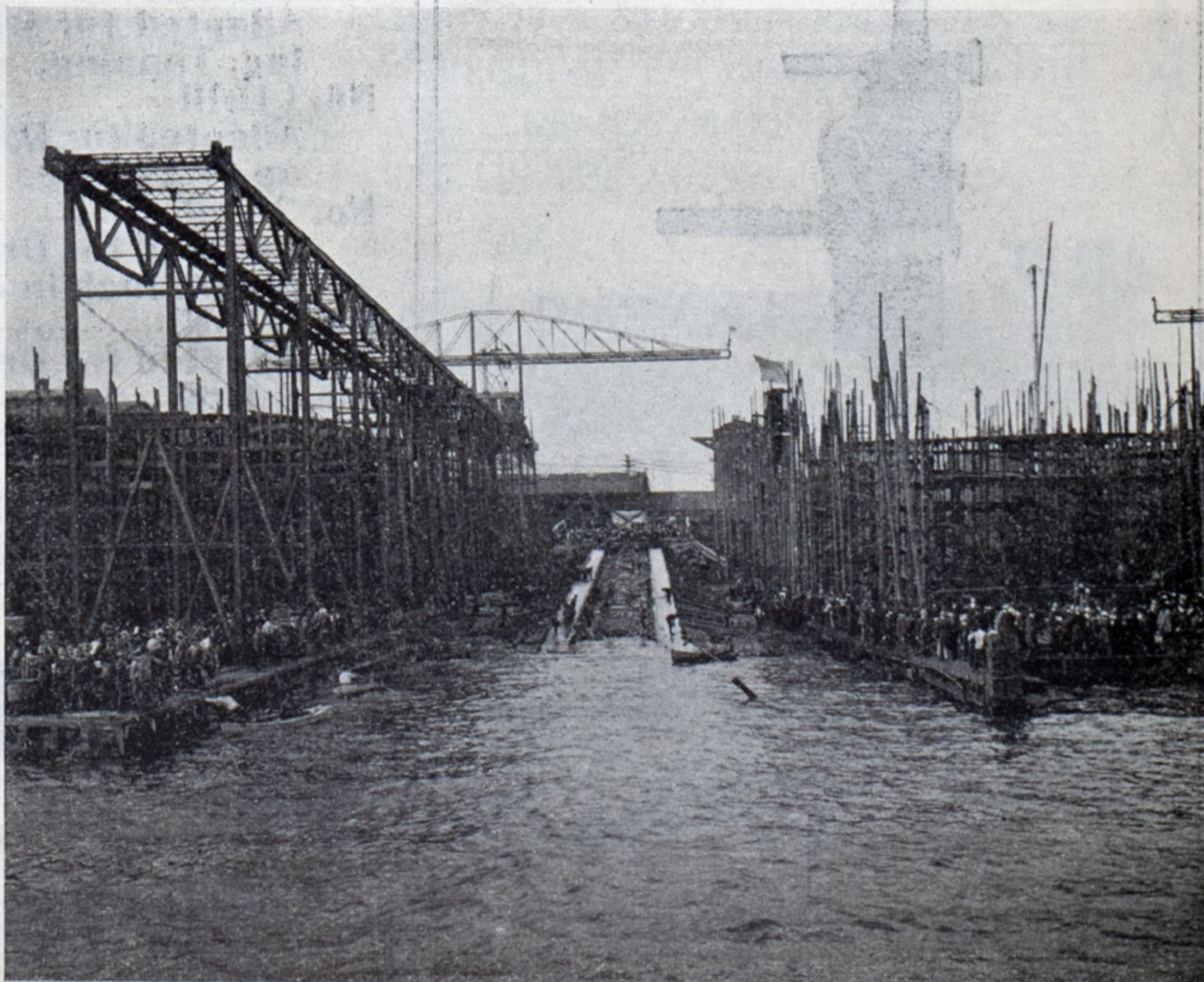
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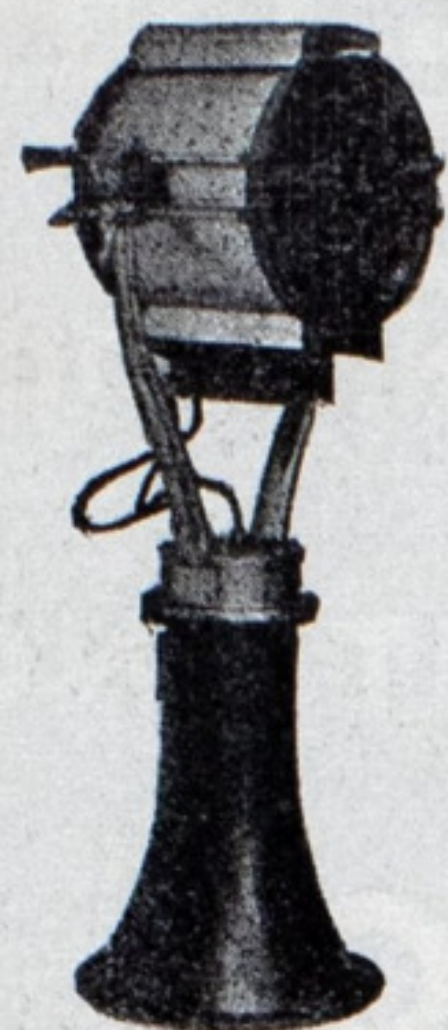
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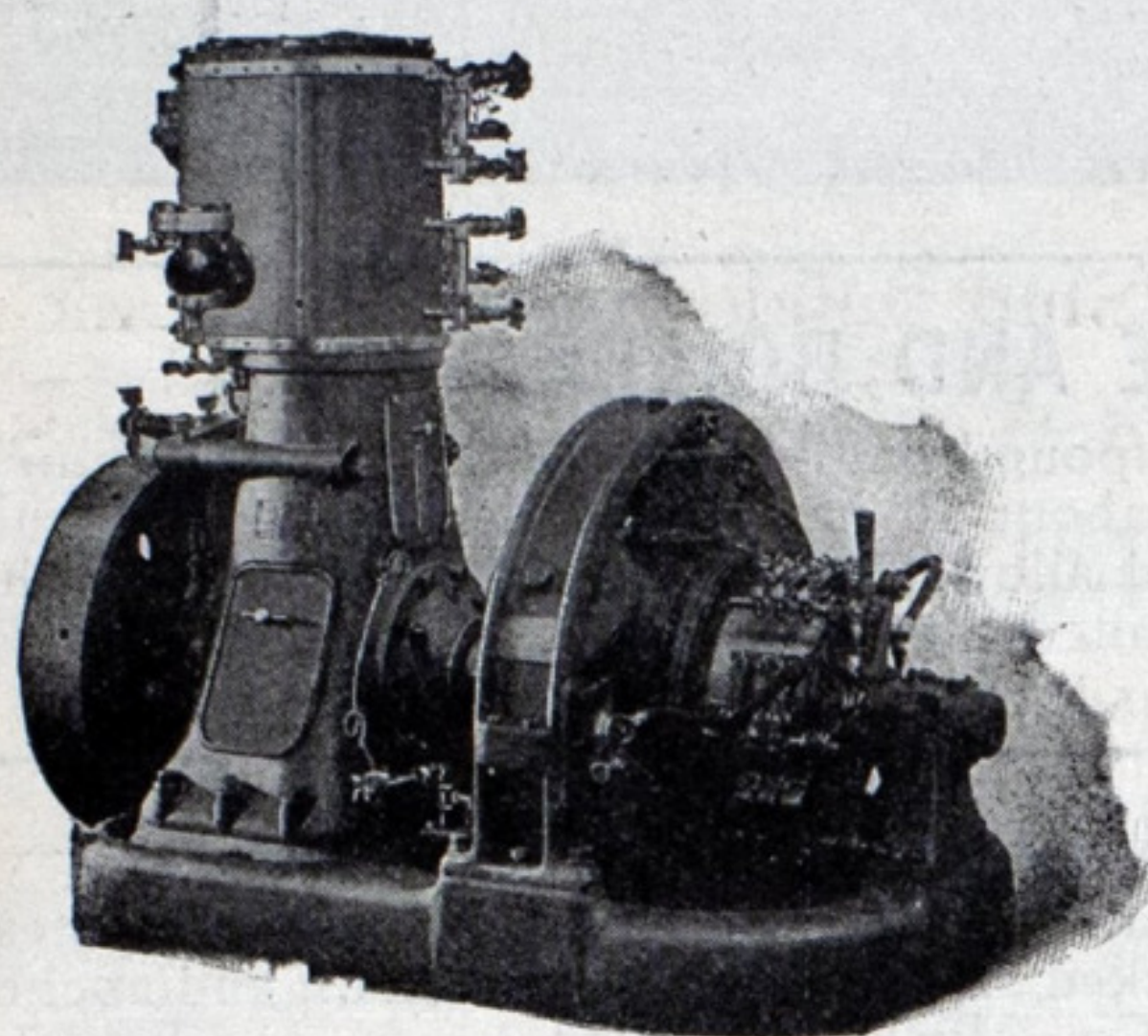
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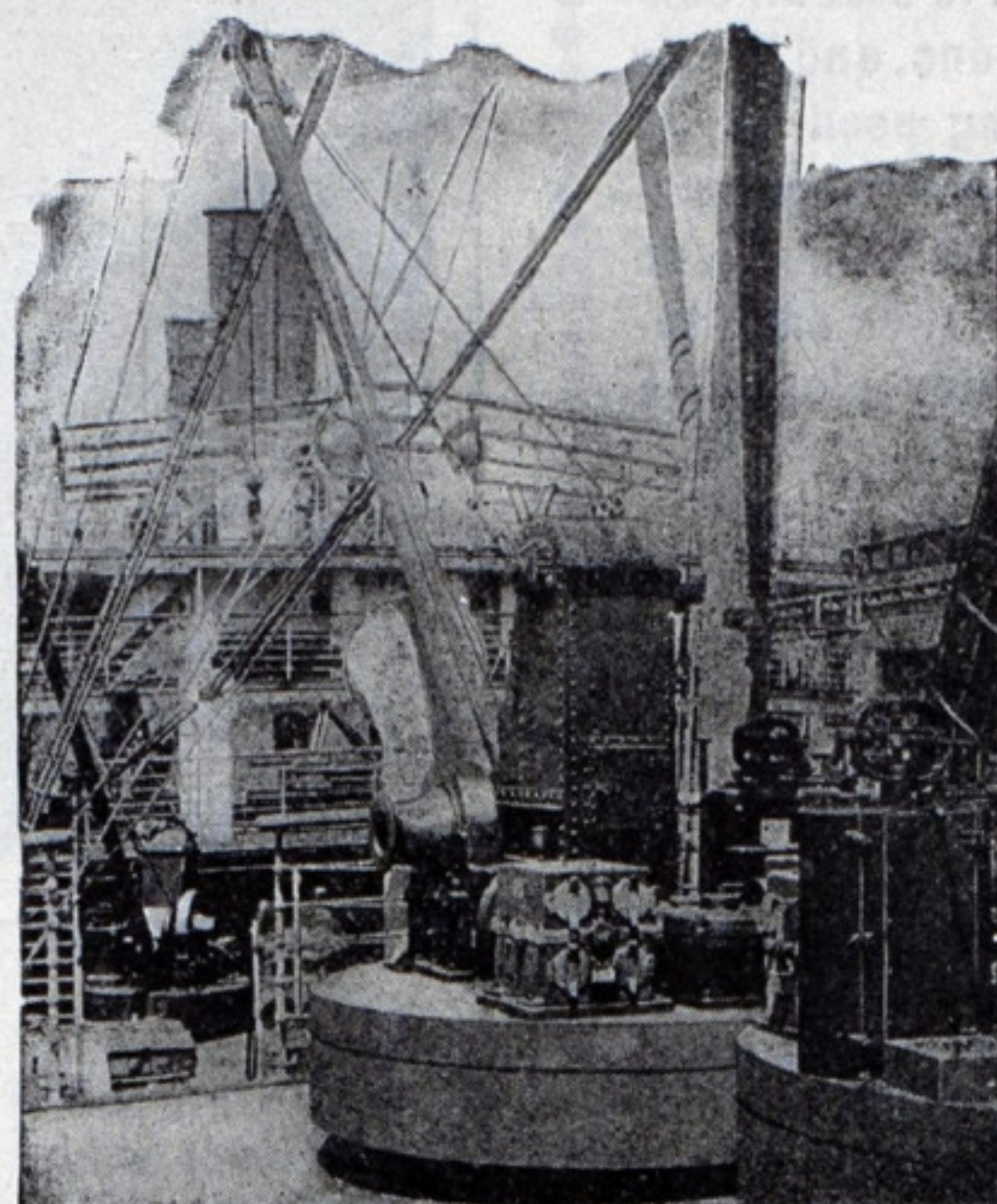
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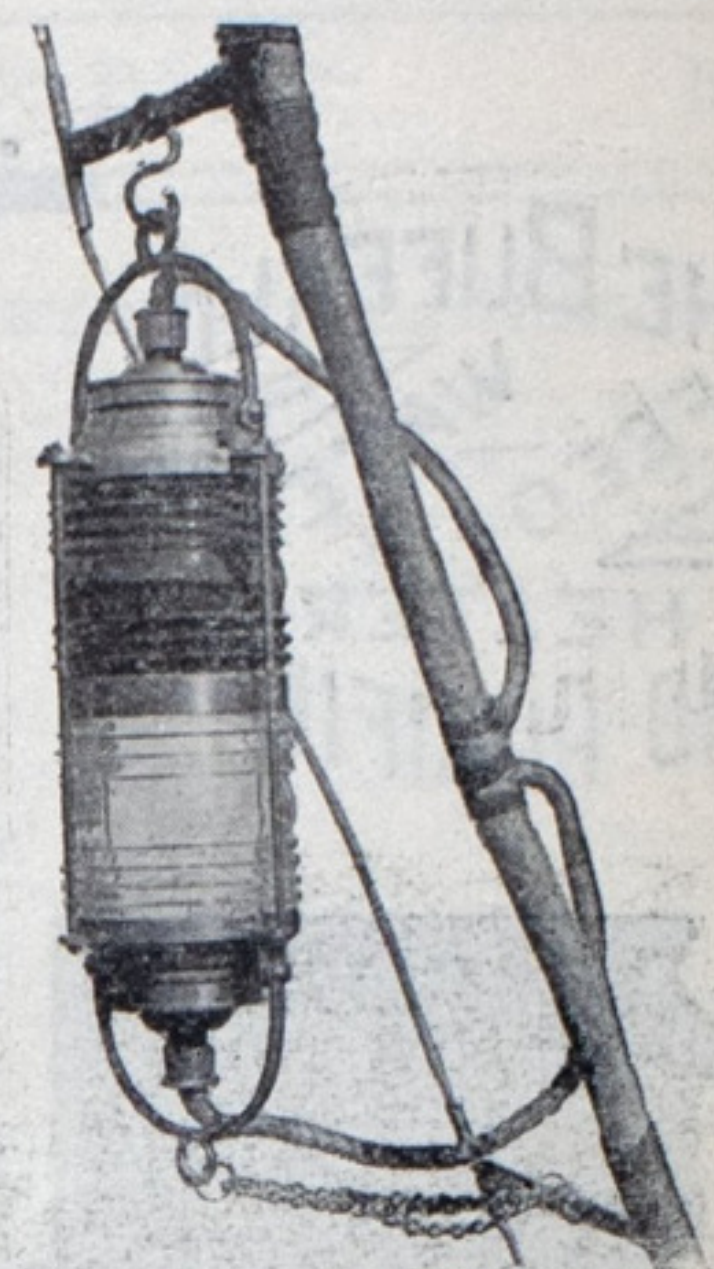
13 Inch Searchlight.



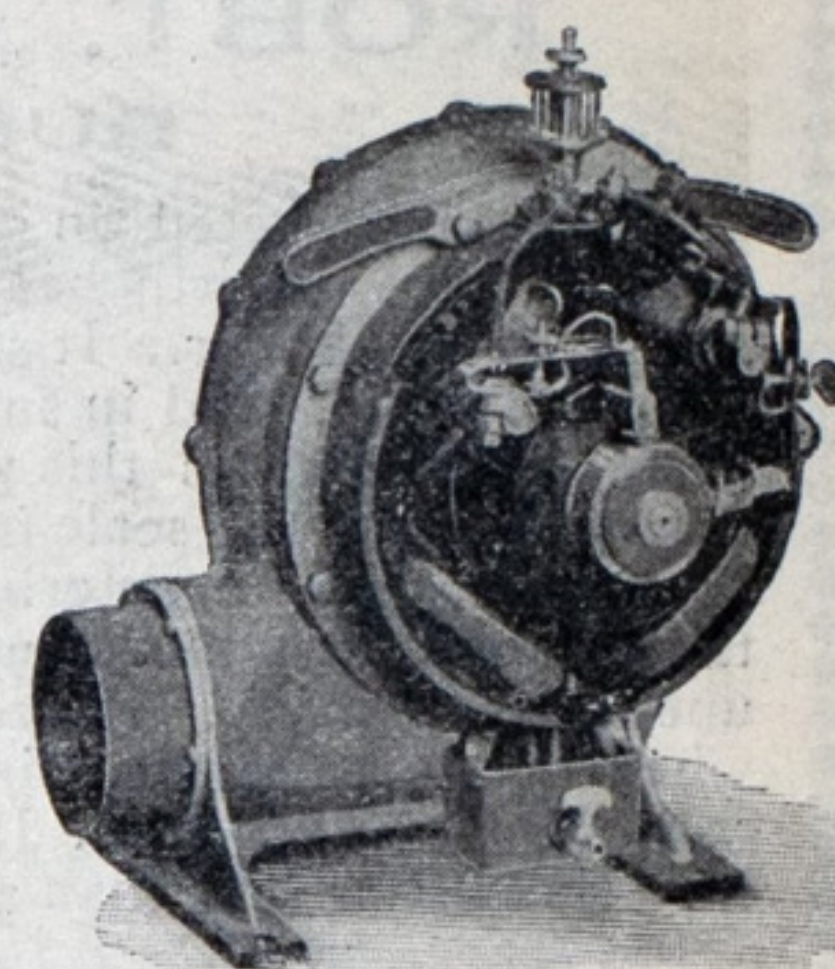
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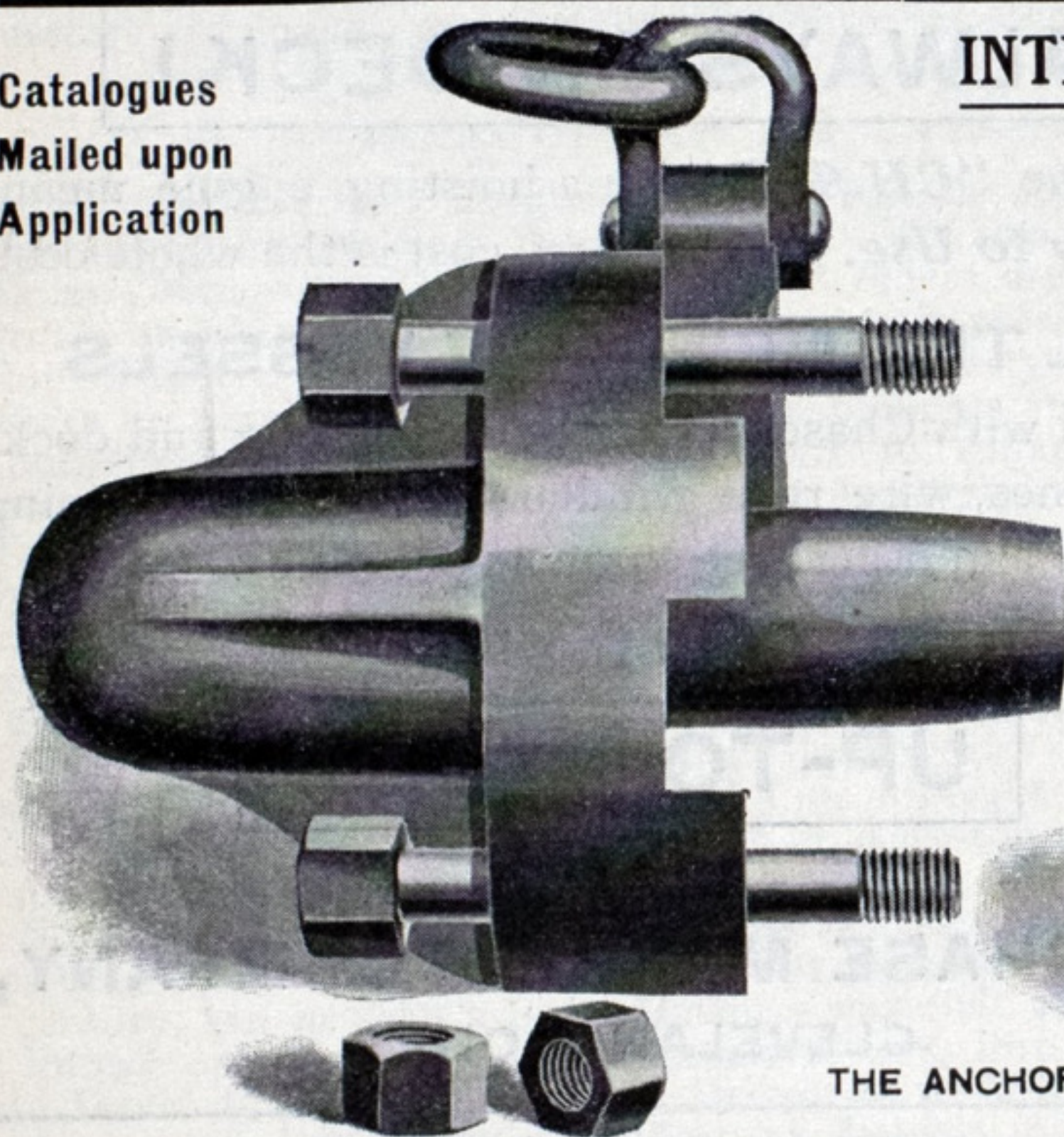
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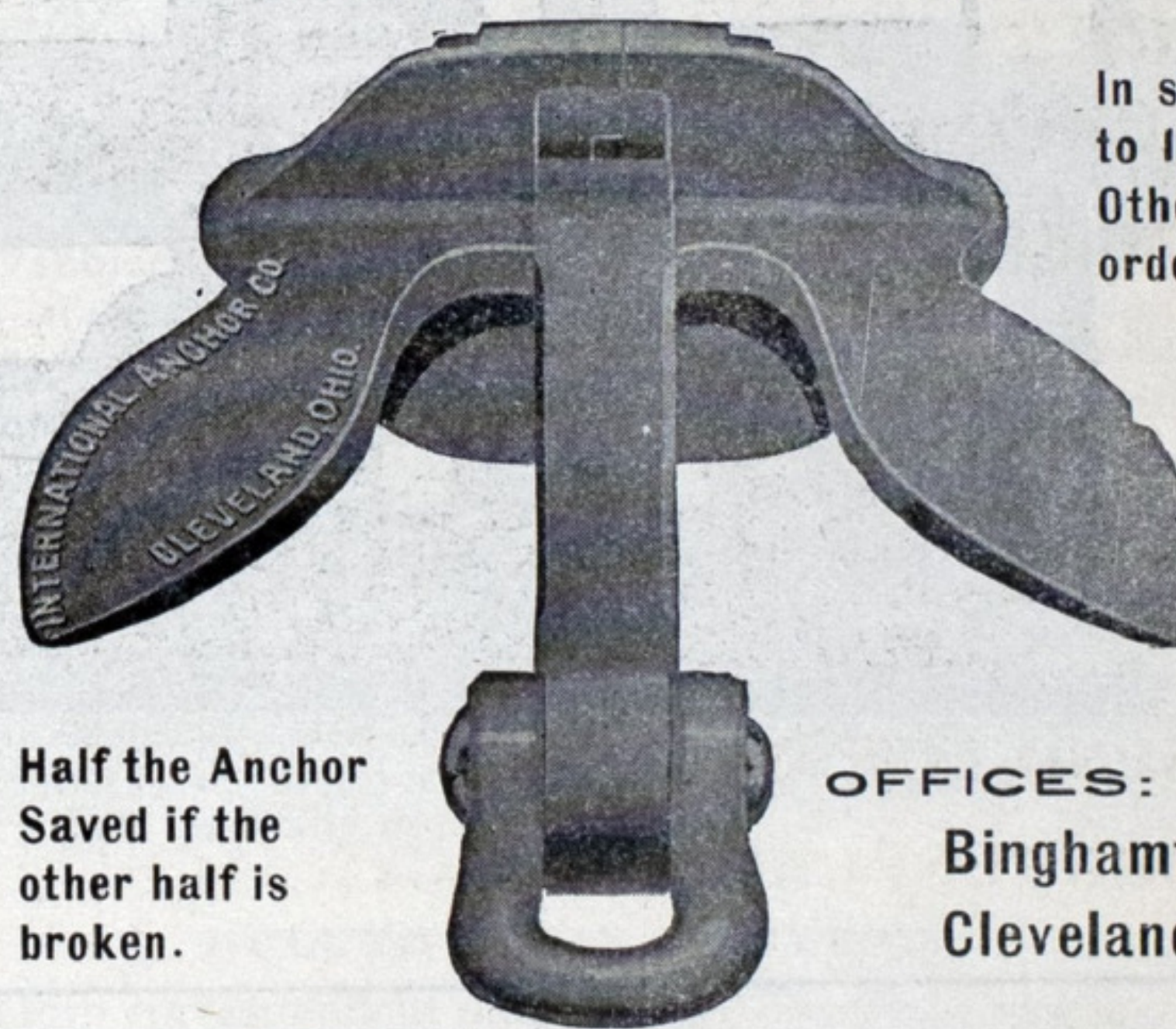
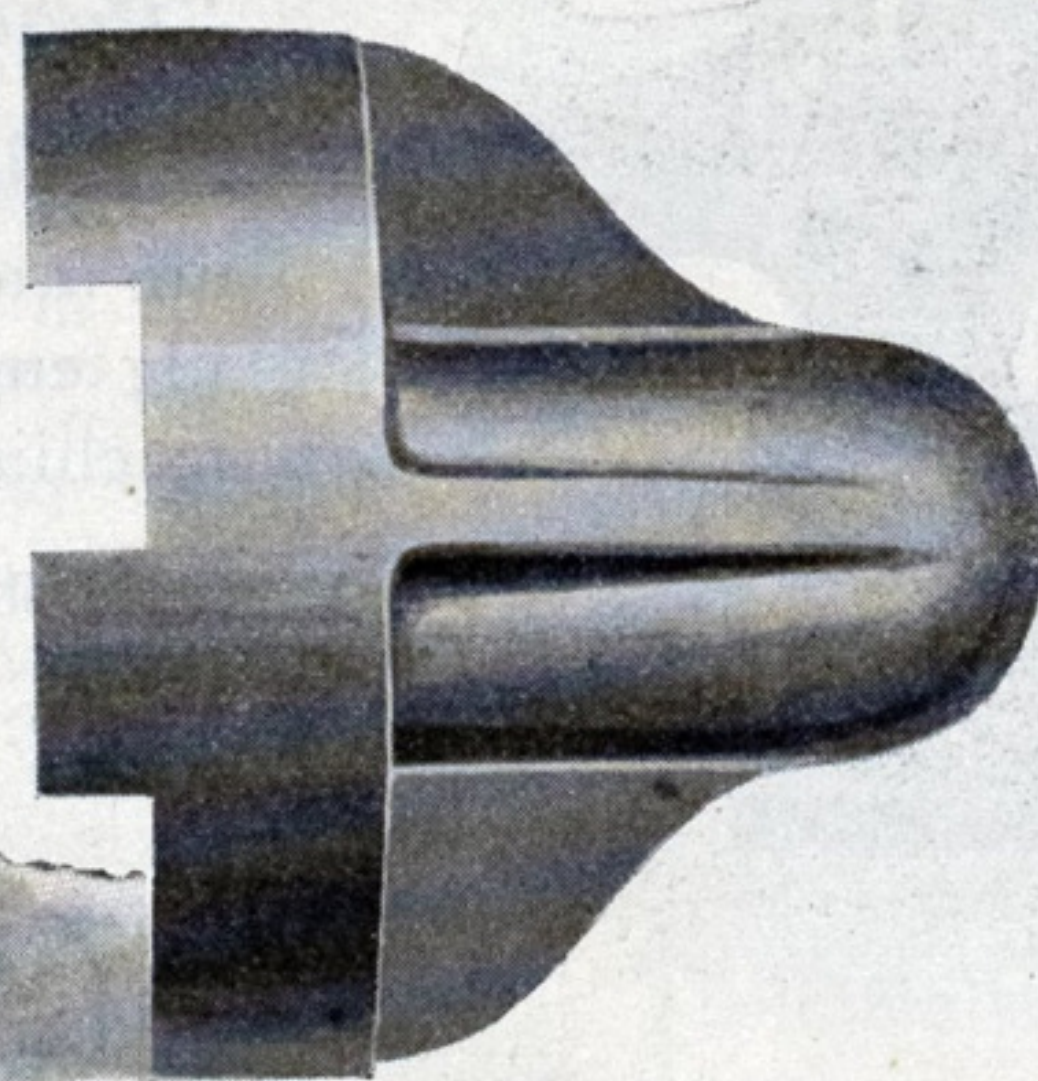
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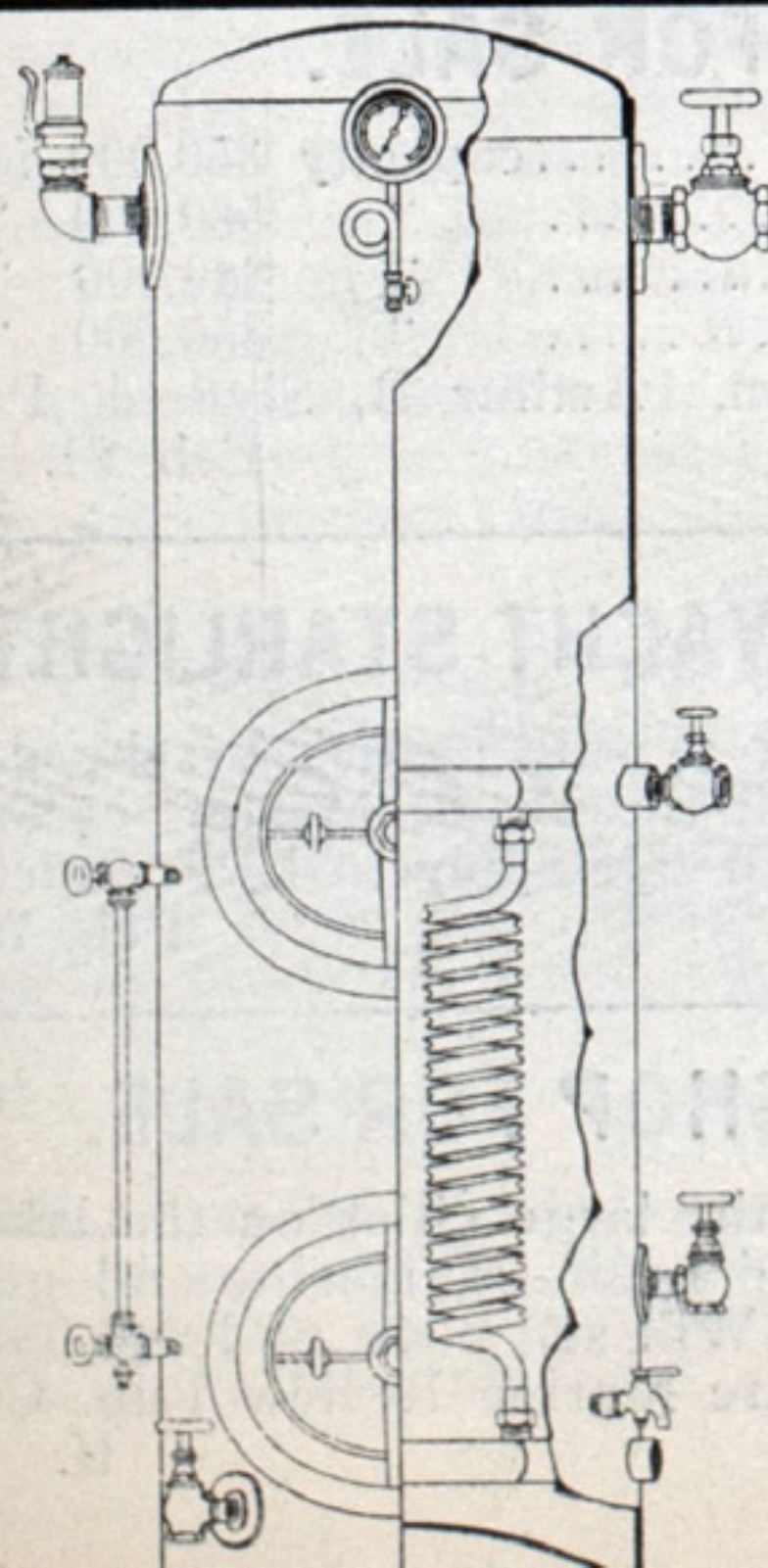
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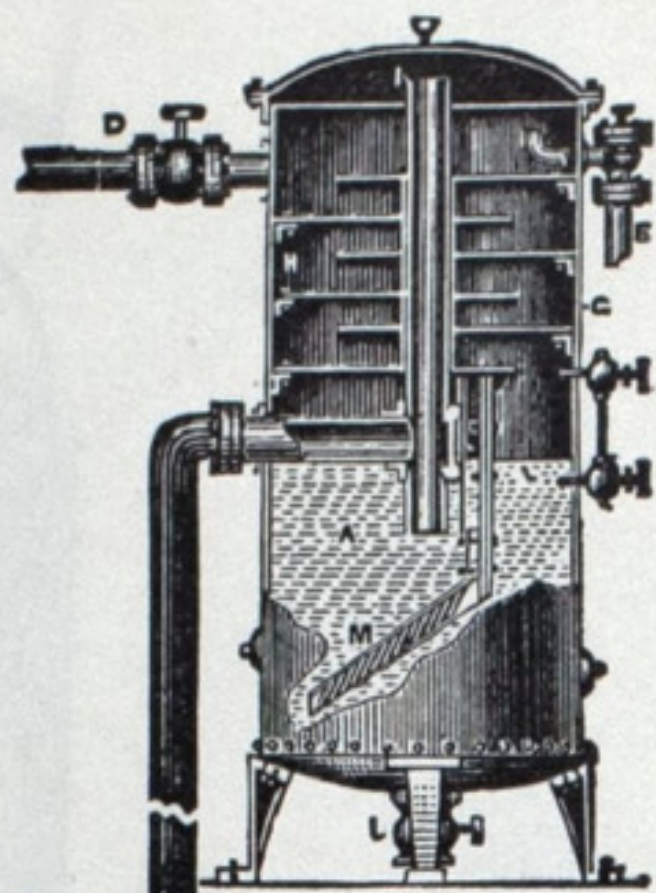
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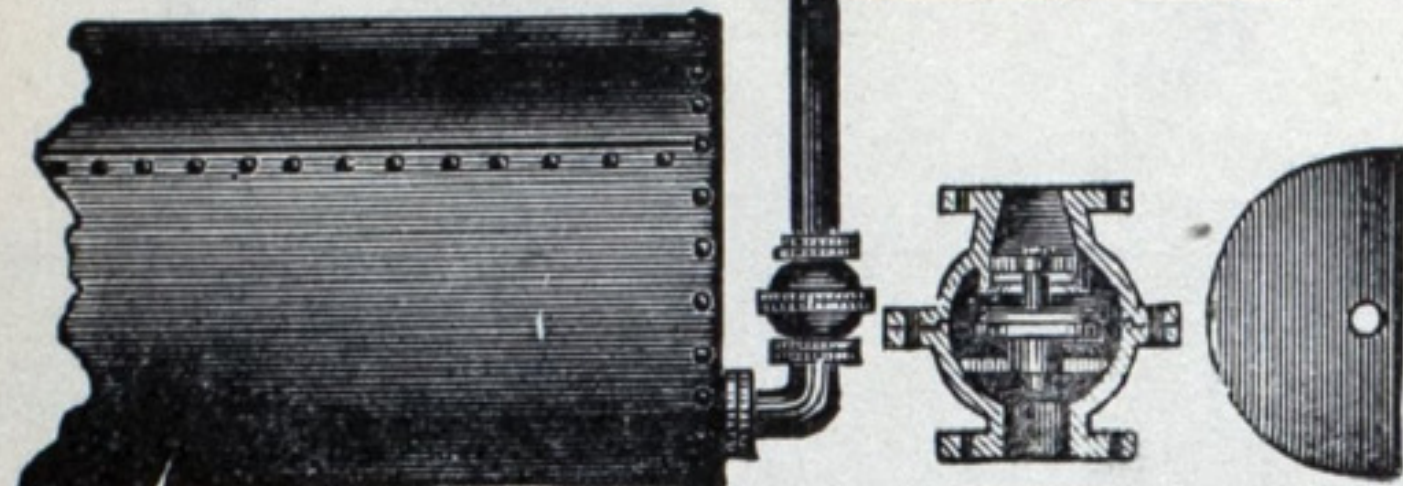


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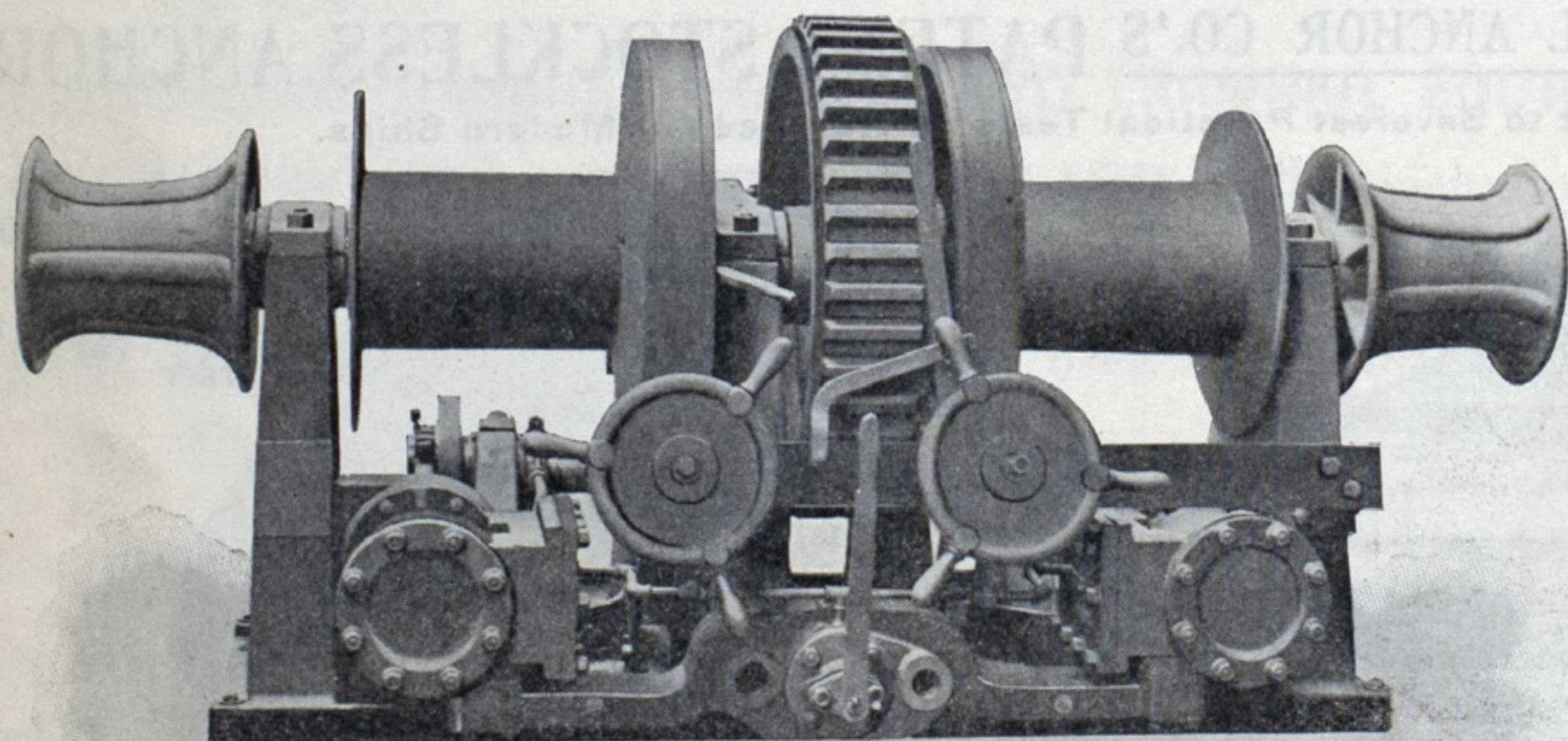
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